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COMMERCIAL AIRCRAFT NOISE DEFINITION - L-1011 TRISTAR. VOLUME III - PROGRAM USER'S MANUAL

Lockheed-California Company

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COMMERCIAL AIRCRAFT NOISE DEFINITION L-1011 TRISTAR

Volume III-Program User's Manual

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FINAL REPORT

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16. Abstract

Calculation procedures to describe airplane noise during takeoff and approach have been programmed for batch operation on a large digital computer. Three routines are included. The first normalizes far-field noise spectra to reference conditions and then determines spectra at various distances from the airplane, for airport elevations between sea level and 6000 feet and ambient temperatures between 30°F and 100°F. Overall sound pressure levels, A-weighted noise levels, perceived noise levels, and effective perceived noise levels are calculated. The second routine uses aerodynamic and engine thrust data to produce takeoff and approach flight path description. The basic takeoff is at constant equivalent airspeed, with thrust reduction or acceleration option after gear-up. The approach is along any constant glide slope between 3 and 6 degrees at constant airspeed, with a two-segment option. The last routine combines noise propagation and flight path information to produce constant noise contour "footprints." The program has been exercised on Lockheed L-1011-1 Tristar/Rolls-Royce RB.211-22 data, providing results in EPNdB and dBA.

- o Volume I contains detailed discussion of the calculation procedures.
- o Volume II includes L-1011-1 noise propagation and airplane performance and samples of contours.
- o Volume III presents the logic behind the calculations and outlines the computational procedures.
- o Volumes IV and V describe the computer program and give instructions for its operation.

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TABLE OF CONTENTS

FIGURES

NOMENCLATURE

SYMBOL Engr.	FORTRAN	UNITS	DESCRIPTION
a	ACC	KTAS/SEC	Calculated level-flight acceleration.
a_i	ACCI	KTAS/SEC	Acceleration. An input.
area	AREA	SQ. ST. MI.	Area enclosed by contour (cumulative vs. x).
-	ATMOS	-	An atmosphere subprogram. Entry is with a pressure altitude; HP, HTP, or Have. Returns include the parameters DT, TRAT, DELTA, SRSIG, and C_e.
C	C	METERS/SEC	Speed of sound.
CB_{FAC}	CBFAC	NON-DIM.	Thrust cutback factor. A decimal between 0. and 1.0. An input.
C_{L_α}	CLALF	-	An input array of CL as a function of angle of attack (α) for various flap settings.
C_D	CD	NON-DIM.	Drag coefficient.
$C_{D_{TRIM}}$	CDTRIM	NON-DIM.	Engine-out trim drag coefficient.
Ce	CE	KEAS	Speed of sound.
C_L	CL	NON-DIM.	Lift Coefficient.
-	CLCD	-	An input array of CD as a function of CL for various flap settings.
$C_{L_{lof}}$	CLLOF	NON-DIM.	Lift-off lift coefficient.
$C_{L_{rms}}$	CLRMS	NON-DIM.	A root-mean-square value of lift coeeficient. A return from subprogram RMS.
C_{L_S}	CLS	-	An input array of stall lift coefficient as a function of flap setting.
C_N	CN	NON-DIM.	Engine-out moment coefficient.
d	D/ DDTAB(I)	FT.	Flyover distance to which spectra is to be attenuated.
D	DRAG	LB.	Drag.
D_c	DC	PNdB	Duration correction.
D_o	DO	FT.	Distance for input data.
D_{wm}	DWM	LB.	Engine-out windmilling drag.
EGA	EGA	dB	Extra ground attenuation.
EPR	EPRT	NON-DIM.	Engine pressure ratio. An input array.
EPNL	EPNL	EPNdB	Effective perceived noise level.
FF	FF	NON-DIM.	Correction factors for -22C engines.

NOMENCLATURE

SYMBOL		UNITS	DESCRIPTION
Engr.	FORTRAN		
-	FLAPV	DEG.	Flap deflection that reflects flap retraction.
FLAP	FLAP	DEG.	Flap selection for takeoff. An input.
FLATR	FLATR	DEG. C	Engine flat rating. A delta temperature above standard. An input.
FN	FN	LB.	Engine thrust. (per engine)
FN_{EO}	FNEO	LB.	Thrust required for level flight with a wing engine out.
FN_{TAB}	FN	LB.	Thrust required for approach from a Weight-Thrust table.
grad	GRAD	NON-DIM.	Climb gradient after gear up.
H	H	FT.	Geometric height above ground.
$\bar{H}$	Have	FT.	Average pressure altitude.
H_p	HP/H	FT.	Pressure altitude (airport). An input.
HT_{CB}	CBHT	FT.	Engine cutback altitude. An input. A pressure altitude.
HT_G	HTG	FT.	Geometric height or altitude (above sea level).
HT_{GU}	GUHT	FT.	Height or altitude above sea level for gear up.
HT_{GU}	GUHTO	FT.	Height above 35 feet for gear up. A third degree curve fit of flight test data. A function of flight path angle at liftoff (γ_{lof}).
HT_p	HTP	FT.	Pressure height or altitude (above sea level).
i	I	NON-DIM.	1/3 octave band number. i=1 is 50 Hz band.
IEPR	IEPR	NON-DIM.	Engine pressure ratio. Interpolated for in an EPR table as a function of FN/δ and Mach number.
KK	KK	NON-DIM.	An input array of correction factors to allow for a match of flight test noise profiles with the mathematical simulation.
L	-	LB.	Lift.
L_A	-	dB A.	A - sound level.

NOMENCLATURE

SYMBOL		UNITS	DESCRIPTION
Engr.	FORTRAN		
L_{ave_i}	L	dB*	Average normalized 1/3 octave band SPL.
L_c	LC	dB	Level on centerline.
L_i	L	dB*	1/3 octave band sound pressure level.
L_s	LS	dB	Level on sideline.
L_1	LLL	dB	Level with Extra Ground Attenuation
L_2	LLL	dB	Level without Extra Ground Attenuation.
$L_{200,i}$	L	dB*	1/3 octave band SPL at 200 ft and reference conditions.
M	MACH	NON-DIM.	Mach number.
$\bar{M}$	MAVE	NON-DIM.	Average Mach number. Ratio of Vave to Ce.
M_{lof}	MLOF	NON-DIM.	Mach number at liftoff.
M_{lof1}	MLOF1	NON-DIM.	Mach number at liftoff.
$NE/NE_{in}/NE_{out}$	NE/NENGO/NENGIN	NON-DIM.	Number of engines.
$\frac{N1}{\sqrt{\theta}}$	XN1	PERCENT	Normalized fan speed. (100% is 3900 RPM)
OASPL	OASPL	dB*	Overall sound pressure level.
OBSPL		dB*	Octave band sound pressure level.
OS	OS	NON-DIM.	Multiplier. Overspeed factor. 1.05 is 5% overspeed, for example.
p	PRESS	INCHES Hg	Ambient pressure.
P		Pascals	Ambient pressure.
PNL	PNL	PNdB	Perceived noise level.
q	Q	$LB./FT.^2$	Dynamic pressure.
-	QKTRP3	-	A trivariate interpolation subprogram. Entry is with a pressure altitude, Mach number, temperature increment, and THRUST array. An interpolated value of thrust (FN) is the return.
R	R	FT.	Slant distance to the flight path.
RAT	RAT	NON-DIM.	Minimum computed thrust cutback factor.
R_c	R	FT.	Distance to flight path with the velocity correction.
R_e			Equivalent earth radius. 6353.5 Km or 20844 ft.

*Reference: 0.0002 microbar

NOMENCLATURE

SYMBOL		UNITS	DESCRIPTION
Engr.	FORTRAN		
Relative Humidity	RLTHUM	PERCENT	Relative humidity.
RMS	RMS	-	A subprogram which calculates the root-mean-square value of an initial and final velocity. The rms velocity is used to calculate an associated rms value of lift coefficient, CLrms, which is a return from the subprogram.
R/C or R/D	ROC	FT./SEC.	Rate-of-climb or rate-of-descent. Tapeline.
R_1	R1	FT.	Distance to flight path for a given level without EGA.
R_2	R2	FT.	Distance to flight path for a given level with EGA.
S	S	FT^2	Wing area. (3456 FT^2). An input.
S_a	SA	FT.	Downrange distance during ground acceleration from brake release to rotation.
S_c	SC	FT.	Downrange distance during climb from liftoff to 35 feet.
S_{clmb}	SCLMB	FT.	Incremental downrange distance during gear up climb.
S_{GU}	TSGU	FT.	Downrange distance for the climb segment from 35 ft. to gear up.
S_{TOT}	TDIST	FT.	Total downrange distance.
S_r	SR	FT.	Downrange distance during ground acceleration from rotation to liftoff.
t	TTEMP	DEG. F	Ambient temperature.
T	TM/ -	DEG. K/LB.	Temperature or total thrust.
T_{amb}	TAMB	DEG. F	Ambient temperature at altitude.
T_{amb_i}	TAMBI	DEG. F	Ambient airport temperature. An input.
T_{clmb}	TCLMB	SEC.	Time to climb from liftoff. A third degree curve fit of flight test data. A function of flight path angle at liftoff (γ_{lof}).

NOMENCLATURE

SYMBOL Engr.	SYMBOL FORTRAN	UNITS	DESCRIPTION
T_{Clmb}	TCLMBV	SEC.	Time increment for climb after gear up. A fixed value for all climbs except thrust cutback, wherein a value is calculated.
T_{EX}	TEX	LB.	Excess thrust.
T_{FAC}	TFAC	NON-DIM.	Thrust multiplier. An input.
T_{STD}	TSTD	DEG. K	Standard temperature.
TPNL	TPNL	PNdB	Tone corrected perceived noise level.
T_{RAT}	TRAT	NON-DIM.	Temperature ratio, TAMB/TSTD. Return from ATMOS.
-	THRUST	LB.	Engine thrust. An input array of engine thrust as a function of altitude and Mach number.
-	TRP2	-	A bivariate interpolation subprogram. Entry is with a bivariate array (EPR; CLCD; CLALF) and two independent variables (FN/DELTA, Mach number; CL, Flap setting). An interpolated value of a dependent variable (IEPR, CD, ALPHA) is the return.
$(T/W)_{lof}$	TWLOF	NON-DIM.	Thrust to weight ratio at liftoff.
$\bar{V}$	VAVE	KEAS	Average velocity.
Ve	VE	KEAS	Equivalent airspeed.
V_{init}	VINIT	KEAS	Initial velocity.
V_{lof}	VLOF	KEAS	Liftoff speed.
V_{lof}	VVLOF	KEAS	Liftoff speed.
V_R	VR	KEAS	Velocity at rotation.
V_S	VS	KEAS	Stall speed.
V_t	V	KTAS	Velocity for input data of approach.
V_T	TAS	KTAS	True airspeed.
$V_2(2)$	V2(2)	KEAS	Airspeed at 35 feet after engine failure.
$V_2(2)$+10	V2(2)+10	KEAS	Climb airspeed after gear up.
V_2ten	V2TEN	KTAS	V2 speed plus 10 KTAS.
$V_2(3)$	V3	KTAS	Three engine true airspeed at the 35 foot point.

NOMENCLATURE

SYMBOL		UNITS	DESCRIPTION
Engr.	FORTRAN		
V_w	VW	KTAS	Adjusted wind velocity.
V_{w_i}	VWI	KTAS	Wind velocity. Input. - = tail wind. + = head wind.
W	W	LB.	Airplane takeoff weight. An input.
W_{a_i}		dB.	A-weighting.
W/W_{CORR}	W/WCORR	LB.	Uncorrected (W) or energy corrected weight (WCORR).
X	X/XX	FT.	X distance along flight path projected to the ground.
X'	XPJ	FT.	X intercept of noise level on the ground on the extended runway centerline.
X"	XPPJ	FT.	X intercept of noise level on the ground on the sideline.
Zp	ZP	KM.	Pressure altitude.
α	ALPHA	DEG.	Angle of attack.
α_i	ALPHA	dB/1000 FT.	1/3 octave band absorption coefficient for the input conditions. Calculated by ARP 866.
α_{o_i}	ALPHAO	dB/1000 FT.	1/3 octave band absorption coefficient for the FAR day conditions.
α_{r_i}	ALPHAR	dB/1000 FT.	1/3 octave band absorption coefficients for the reference day conditions.
β	–	DEG.	Angle of elevation to aircraft along cone of max. radiation.
γ_{lof}	GAMLOF	DEG.	Flight path angle at liftoff.
δ	DELTA	NON-DIM.	Ambient to sea level pressure ratio, $Pamb/P_o$.
$\Delta FN_{\Delta V}$	DVCORR	LB.	Incremental thrust due to incremental approach speed.
ΔFN_{V_W}	B*VW	LB.	Incremental thrust due to wind.
ΔH	DELH	FT.	Altitude or height increment. Set at an initial value of 63 ft. in the climb from 35 ft. to gear up climb segment.

NOMENCLATURE

SYMBOL		UNITS	DESCRIPTION
Engr.	FORTRAN		
ΔH	DELHV	FT.	An altitude increment for gear up climb.
ΔHT_{GU}	HTGU	FT.	Calculated delta height from 35 feet to gear up. This accounts for an increase in true airspeed in this segment.
$\Delta(N_1/\sqrt{\theta})$	DNA DNE	PERCENT	Increment to $N_1/\sqrt{\theta}$. subscripts alt - due to aircraft pressure alt. EPR - due to engine pressure ratio.
ΔT	DT	DEG. C	Temperature increment. Difference between current and standard-day temperature at altitude. A return from ATMOS.
Δt	DTIME	SEC.	Incremental time to climb.
ΔV	DELV	KTAS	Incremental approach speed above 1.3 V_S.
θ	PITCH	DEG.	Vehicle pitch angle with respect to the ground.
θ	THETA	DEG.	Assumed angle of radiation measured from inlet.
μ_r	MUR	NON-DIM.	Coefficient of rolling friction. Set at 0.015.
ρ	RHO	KG/M^3	Atmospheric density.
ρc	RHOC	MKS rayles	Characteristic impedence.
$\sqrt{\sigma}$	SRSIG	NON-DIM.	The square root of density ratio. A return from subprogram ATMOS. Establishes an equivalence between true airspeed and equivalent airspeed.
ϕ	SLOPE	RADIANS	Airport runway slope. -Down, + Up. An input.

Abbreviations

BR	Brake release
ROT	Rotation
LOF or lof	Liftoff
35	35 foot point
GU	Gear up

SECTION 1

INTRODUCTION

The detailed discussion of the procedures and calculations for determining the noise patterns resulting from takeoff and approach operations of a commercial transport is presented in Volume I of this five-volume report. Performance and noise data for the Lockheed L-1011-1 Tristar are contained in Volume II. This Volume III presents a description of the logic and the procedures for the noise definition calculations which have been developed into a digital-computer program. Sufficient detail is included to permit judgments to be made regarding the applicability of the program to any particular noise study.

The aircraft noise definition analysis described here starts with the airplane/engine's far field noise signature in the form of one-third octave band sound pressure level spectra at a reference distance from the airplane, at a reference airport elevation, ambient temperature, and relative humidity. Then the noise versus distance-from-airplane characteristics may be calculated and used in conjunction with the airplane's distance from any desired point on the ground to determine the noise level at that point. The airplane's distance is provided by the performance subroutine which generates either the takeoff or approach flight path. Ground noise patterns are generally produced as noise directly under the airplane as a function of distance from an airport reference point or as constant noise contours (footprints) at preselected noise levels. The airplane performance calculations are based on normal takeoff and approach operating procedures. However, sufficient flexibility has been included to permit noise evaluations of variations in operational procedures.

SECTION 2

PROGRAM CAPABILITIES

A purpose of the Commercial Aircraft Noise Definition study reported in the several volumes of this report is to develop and illustrate a computational procedure which will produce the noise patterns on the ground produced during takeoff and landing operations of an airplane in the vicinity of an airport. These noise patterns may then be used for comparing airplanes, for evaluating operational procedures, and for integrating into the total noise impact of the air traffic at an airport. The computational procedure consists of two parts, or subroutines, each providing independent output data which may be used by themselves or used as input to the noise pattern calculations. These subroutines produce noise propagation data and airplane performance, takeoff or approach, data for use in the footprint routine which produces the noise patterns.

The noise propagation calculation subroutine provides a means for determining far-field noise source characteristics, or signatures, from measured or predicted acoustic spectra and for calculating noise versus distance data from these signatures. The acoustic signature generation may be accomplished from measured or calculated noise spectra and durations at any far-field distance from the airplane and at any atmospheric conditions within the scope of SAE ARP 866 (Reference 1) and at any engine thrust condition. These spectra and durations are normalized to a 200 foot flyover distance from the airplane on a FAR Part 36 reference day (sea level, 77° F, 70% relative humidity). This portion of the calculation routine thus provides a procedure for normalizing flyover noise measurement data to reference conditions. If noise at several thrust settings is available, then the dependence of noise on thrust at reference conditions is available. The noise is in the form of one-third-octave or octave band spectra, overall level, A-weighted noise level, perceived noise level, and effective perceived noise level. If other noise weighting are desired, then they may be introduced into the calculation program. The remainder of the calculation procedure determines, starting with the 200 foot spectral signatures, noise versus distance at any atmospheric conditions

specified and for all the noise level forms above. A complete description then exists for the noise characteristics of the airplane/engine and of the noise propagation characteristics at any atmospheric conditions at airport elevations from sea level to 6000 feet.

The airplane performance subroutine is comprised of two separate routines. The takeoff section provides the necessary data in the form of geometric altitude, distance from brake release, speed, engine data $N_1/\sqrt{\theta}$ for input to the footprint program. The approach section provides the same data, except that distance to threshold is used. When used as part of a combined program, these performance sections provide the data to the footprint program for the specific cases required (see Section 4.2, Figure 4.2-3). These data can also be output in tabular form alone (see Section 4.2, page 4-38) without any output from the footprint program.

Three specific types of takeoff flight profiles can be produced. One is a takeoff and climbout at constant velocity after gear up; another is a takeoff and climbout with an accelerated climb after gear up; the third is a takeoff and climbout with the option of a thrust cutback after gear up. Approach may be along any glide slope between 3 and 6 degrees or may be a two-segment maneuver with the two glide slopes intersecting at any predetermined altitude.

The noise footprint routine combines airplane flight path data with noise propagation data in the calculation of noise on the ground during takeoff and approach maneuvers. The flight path and propagation data may be the output of the program subroutines discussed above or may be available from other sources. The footprint program calculates noise directly under the flight path and along a sideline one-quarter nautical mile from the flight path projection and calculates the coordinates of points on the ground where any specified maximum noise levels are attained. Constant noise contours for the specified maximum levels may then be drawn through the calculated points either by hand or by means of a machine plotting routine. The specified noise levels may be any physical, weighted, or computed levels for which propagation information is available, either from the noise propagation routine or from some other source.

An integration for area within a contour is performed when the maximum noise point coordinates are being calculated and the total area enclosed by a given contour accompanies the contour closing point. Contour-enclosed areas provide an indication of community exposure to various levels of noise during operation of an airplane. They may also be used for evaluating the impact of airplane variations, such as weights and flap angles, and for studying the effects of procedural variations, such as takeoff thrust cutback and two segment approach. The footprint data, as well as the noise propagation data, may also be used for inclusion in calculations of cumulative noise exposures resulting from the total air traffic at an airport during any period of time.

The aircraft noise definition program discussed above is believed to be a comprehensive and powerful tool for noise studies of airplane operations in the vicinity of airports.

SECTION 3

MATHEMATICAL MODEL

The calculation of the noise patterns for an airplane flyover is done by a series of routines. The noise propagation routine starts with a far-field input spectrum or a group of spectra, either measured or predicted, and adds appropriate attenuation to get noise versus distance from the noise source. The noise may be shown as A-noise level, perceived noise level, effective perceived noise level (References 2 and 3), or some other weighted level or subjective noise measure. A noise versus distance propagation characteristic is determined for various engine thrust settings in the range of interest.

The performance routine is used to calculate the takeoff or the approach flight paths, including the airplane velocity and the engine power setting. Included in the takeoff portion of the routine are options for thrust cut-back or for airplane acceleration during climb after gear up. The approach portion of the routine incorporates the capability for use of any glide slope between 3^{o} and 6^{o} and for the use of a two segment approach. The equations and methods developed by the Lockheed-California Company Commercial Engineering Flight Test organization (Reference 4) were used and adapted for the performance routine.

Finally, the footprint routine utilizes distances from the airplane flight path, from the performance subroutine, and noise versus distance, from the noise propagation subroutine, to calculate the coordinates of constant noise positions on the ground and generates the plots of the constant noise contours. In Section 3.5 a general flow diagram of the complete computation program is presented as an aid toward understanding the interplay among the several routines.

3.1 NOISE PROPAGATION

The noise propagation subroutine calculates noise levels versus distance, for a given set of conditions of airport elevation, ambient temperature, and relative humidity using spherical spreading (inverse square) attenuation and extra air attenuation (EAA) due to atmospheric absorption as defined in the proposed revision to SAE ARP 866 (Reference 5). The calculation is done both without and with extra ground attenuation, using a mathematical model of SAE AIR 923 (Reference 6), to provide propagation characteristics for the two extreme cases of essentially vertical noise paths from the airplane and of a horizontal path close to the ground. A homogeneous atmosphere is assumed; i.e. temperature and relative humidity are constant over the entire noise path. For the over-the-ground propagation calculation, shielding of the noise from far-side engines by turbulent exhaust from near-side engines is assumed, and only half the number of engines is considered as contributing to the noise.

The levels calculated by the subroutine are one-third octave-band sound pressure levels (SPL), overall sound pressure level (OASPL), and octave-band sound pressure levels (OBSPL), in units of dB re 0.0002 microbar; A-weighted noise level (L_A), in dBA; perceived noise level (PNL) and tone-corrected perceived noise level (PNLT) in PNdB; and effective perceived noise level (EPNL) in EPNdB. Noise signatures for the airplane/engine noise source are first required, at any distance from the source and at any meteorological conditions included in ARP 866, in the form of one-third octave-band sound pressure levels. These may be measured or calculated spectra. These signature spectra are normalized to a 200 foot from noise source sideline distance for a FAR Part 36 reference day (sea level, 77° F, 70% relative humidity) and then averaged. The averaged, normalized spectrum may then be modified to any other set of conditions and to various specified distances, calculating the noise levels listed above. Normally distances of 200, 370, 800, 1600, 3200, 6400, and 12,800 feet are specified, but other distances may be used. Distances of less than 200 feet should be avoided, particularly with large engines, since these may be in the near field where the far-field propagation

assumption of the program will not be valid. If noise signature data are available for various engine thrust settings, then a noise versus distance calculation will be carried out for each specified thrust condition.

3.1.1 Propagation Input Parameters

For each set of conditions for which data are available for normalization to 200 foot noise signatures, the following inputs are needed: measured or predicted one-third octave-band spectra, temperature in degrees Fahrenheit, relative humidity, atmospheric pressure in inches of mercury, number of engines, distance to source (flyover or radial), angle of noise radiation, aircraft velocity in KEAS, and duration correction. For each set of output conditions for the noise propagation calculation it is necessary to specify a table of distances for which attenuations are to be calculated, number of engines, lower and upper frequency band for which tone corrections are to be allowed, pressure altitude at the airport elevation, temperature deviation from ISA standard in degrees Centigrade, and relative humidity. As many input spectra as available may be entered and averaged, and as many sets of output conditions as desired may be run for each case.

3.1.2 Propagation Calculation

The subroutine takes each input spectrum and each spectrum developed in the course of the calculations and calculates OASPL, L_A, PNL, PNLT, OBSPL, and EPNL. The overall sound pressure level is calculated by summing the one-third octave-band levels logarithmically.

Accordingly,

$$\mathrm{OASPL} = 10\ \mathrm{LOG}_{10} \sum_{i=1}^{24} \mathrm{antilog}\ (L_i/10) \qquad (3.1\text{-}1)$$

The A-noise level is calculated in a similar manner to OASPL after the A-weighting values from IEC 179-1965 (Reference 2) are added to each one-third octave-band level.

$$L_A = 10\ \mathrm{LOG}_{10} \sum_{i=1}^{24} \mathrm{antilog} \left(\frac{L_i + W_{ai}}{10}\right) \qquad (3.1\text{-}2)$$

Perceived noise level and tone-corrected perceived noise level are calculated by the method outlined in FAR Part 36, Appendix B (Reference 3). The octave band sound pressure levels are calculated logarithmically, summing the one-third octave-band levels in groups of three.

$$OBSPL_k = 10\ LOG_{10} \sum_{i\ =\ 3k-2}^{3k} \text{antilog}\ (L_i/10)\ \text{dB} \quad (3.1\text{-}3)$$

for k = 1, 2, ...8,

The subroutine will, for each case, take any number of one-third octave band spectra at the given conditions and normalize them to 200 feet, FAR Part 36 reference day, for the specified number of engines and then take an average of the normalized spectra, duration corrections, and radiation angles. If the input distance is a radial distance to the aircraft, it is converted to flyover distance by multiplying by sin θ. To normalize the spectra:

$$L_i = L_i + 20\ LOG_{10}\ (D_o/200) + (D_o - 200)\ /\ (1000 \sin\theta)\ \alpha_i$$
$$+ (200/(1000 \sin\theta))\ (\alpha_i - \alpha_{o_i}) + L\rho c_o + LOG\ N \qquad \text{dB} \quad (3.1\text{-}4)$$

where: D_o is the input flyover distance — ft.

θ is the radiation angle — deg.

α_i is the absorption coefficient for the input conditions — dB/1000ft. calculated from the temperature and relative humidity as in ARP 866 (Reference 3)

α_{o_i} is the absorption coefficient for the FAR day — dB/1000ft.

i is the one-third octave-band number (50 Hz band is number 1)

$L\rho c_o$ is $10\ LOG_{10}\ (410/\rho c)$ for the test conditions

LOG N is the adjustment factor for the number of engines, equal to $10\ LOG_{10}\ (NE_{out}/NE_{in})$

ρc is calculated from the input temperature (t) and pressure (p) using the following relationships derived from the ideal gas laws — Rayles

$T = (t + 459.67)/1.8$ to convert from ^oF to ^oK.

$P = 3386.39\ p$ to convert from inches of mercury to Pascals

ρ = P/(287.053 T) is the density — kilograms/meter^3

c = $\sqrt{401.874\ T}$ is the speed of sound — meters/sec

To normalize the duration correction to 200 feet and 160 knots add 10 LOG_{10} (1.25 V/D_o). If there is more than one spectrum, the average is found by

$$L_{ave,i} = 10\ LOG\left[\sum_{k=1}^{n} 10^{(L_{i,k}/10)}\right] /n \qquad (3.1\text{-}5)$$

where i is the band number and k is the spectrum number. The noise radiation angles (θ) and the duration corrections are also averaged, but they are averaged arithmetically. If the input spectra are for a 200 foot FAR day, then the spectra are already normalized and therefore are used as entered.

Once the average normalized spectra are known, they are adjusted to the output conditions. To do this the ambient temperature in degrees Fahrenheit (t), the atmospheric density (ρ), and the speed of sound (c) must be found from the altitude (H) and temperature deviation (Δ).

Accordingly,	Z_p = .0003048 H	km	(3.1-6)
	H_p = $6353.5Z_p/(Z_p + 6353.5)$	km	(3.1-7)
	T_{ISA} = 288.15 - 6.5 H_p	^oK	(3.1-8)
	T = T_{ISA} + ΔT	^oK	(3.1-9)
	t = 1.8T -459.67	^oF	(3.1-10)
	P = 101325 $(288.15/T_{ISA})^{-5.25588}$	Pa	(3.1-11)
	ρ = P/(287.053 T)	kg/m^3	(3.1-12)
	c = $\sqrt{401.874\ T}$	m/sec	(3.1-13)

To adjust the spectrum to these conditions.

$$L_{200,i} = L_{ave,i} + (200/(1000 \sin\theta))\ (\alpha_{o_i} - \alpha_{r_i}) + L\rho c_r) \qquad \text{dB} \qquad (3.1\text{-}14)$$

where α_{r_i} is the absorption coefficient for the output temperature and relative humidity

$L\rho c_r$ is 10 LOG_{10} (ρc/410) for the output conditions

The 200 foot reference day spectrum is attenuated to other distances using inverse square attenuation and extra air attenuation.

$$L_i = L_{200,i} - 20\ LOG_{10}\ (d/200) - ((d\text{-}200)/1000 \sin\theta)\ \alpha r_i \quad dB \quad (3.1\text{-}15)$$

where d is the distance to the flight path in feet

In addition, the duration correction is modified for distance by adding $10\ LOG_{10}\ (d/200)$ to the normalized duration correction.

Extra ground attenuation (EGA) is calculated by a mathematical model of Figure 4 of AIR 923 (Reference 6). To account for the effect of distance, a four segment model is used. With R_g the radial distance from the source,

For $100 < R_g \leq 1000$

$$EGA3 = 3.498078\ R_g/1000 \quad (3.1\text{-}16)$$

$$EGA4 = .7 + 1.2\ (LOG_{10}\ R_g - 2)^{3.8707} \quad (3.1\text{-}17)$$

For $1000 \leq R_g \leq 2500$

$$EGA3 = 3.498078 + 2.875692\ ((LOG_{10} R_g 3)/.39794)^{.788774} \quad (3.1\text{-}18)$$

$$EGA4 = 1.9 + 2.85\ ((LOG_{10} R_g 3)\ /\ .39794)^{.8719} \quad (3.1\text{-}19)$$

For $2500 \leq R_g \leq 4000$

$$EGA3 = 6.37377 + .404659\ ((LOG_{10} R_g 3.39794)/.20412)^{.0243643} \quad (3.1\text{-}20)$$

$$EGA4 = 4.75 + .35\ ((LOG_{10} R_g 3.39794)/.20412)^{.89475} \quad (3.1\text{-}21)$$

For $R_g \geq 4000$

$$EGA3 = 6.77843 \quad (3.1\text{-}22)$$

$$EGA4 = 5.1 \quad (3.1\text{-}23)$$

To account for the frequency effects in the model

$$EGA_i = EGA4 + EGA3\ LOG_{10}\ (f_i/53) \quad dB \quad (3.1\text{-}24)$$

If f is greater than 1700 Hz, then 1700 Hz is used.

Then,

$$L_i = L_i - EGA_i - 5\ LOG_{10}(NE_{out}) \quad dB \quad (3.1\text{-}25)$$

The results of a propagation calculation, without extra ground attenuation, are illustrated in a sample plot in Section 4 of this report.

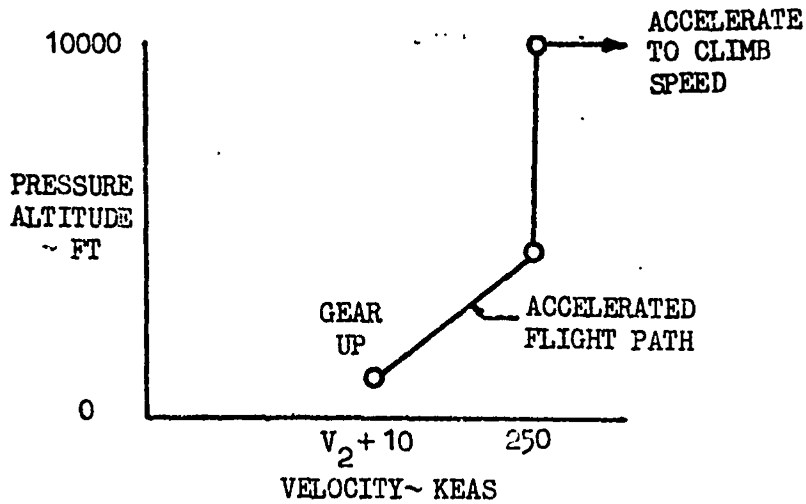
3.2 TAKEOFF PERFORMANCE

This section describes the subroutine which calculates the takeoff flight path from brake release (BR) to about 9500 feet above sea level (ASL) for three different prodedures. All flight paths reflect all engine operation and FAA approved aerodynamic data, thrust characteristics, and speed relationships. The all engine distance to 35 feet is actual and does not include the 15 percent factor associated with FAR field lengths.

The primary flight path is a 3 engine takeoff and climbout at constant equivalent airspeed after gear up. Another path is a 3 engine takeoff and climbout to gear up with the option of a thrust reduction at any point after gear up. During accelerated flight after gear up, the third option, normal cleanup procedures (flap retraction) are followed. The flight path is broken into a number of convenient increments, called segments.

The 1962 Standard Atmosphere (Reference 7) is used throughout for all calculations.

The program uses equations and methods developed by Flight Test (Reference 4) that describe a takeoff and climbout from brake release to a point where the aircraft is at about 9500 feet above sea level (Figure 3.2-1). Using FAA approved thrust, drag, and speed relationships, the aircraft is accelerated from BR to rotation (ROT), ROT to liftoff (LOF), and LOF to a point where the aircraft is at 35 feet (AGL). Then the aircraft is accelerated from the velocity at the 35 foot point (V_2 (3 engine)) to a speed equivalent to the engine out speed (V_2 (2 engine)) plus 10 knots at gear up. After gear up this speed is maintained to about 9500 feet (ASL) with the flap setting used for takeoff. At gear up, any flight acceleration between that corresponding to maximum climb gradient to the maximum acceleration corresponding to level flight may be selected (Figure 3.2-2). Use of the accelerated flight path requires an explanation of the speed schedule after gear up. The sketch shown on the next page shows the speed-altitude relationship required to meet FAR Part 25 (Reference 8) which limits airspeed below 10,000 feet to 250 knots. Also, if climb speed is allowed to increase, normal cleanup procedure (flap retraction) is followed. Successive incremental retraction of the flaps will take place at the airplane speeds specified in the FAA Approved Flight Manual (Reference 9). The stepwise retraction is instantaneous, although the acceleration will be



continuous during the cleanup.

After gear,up any cutback thrust level may be chosen between full thrust and that corresponding to the thrust required for level flight with a wing engine inoperative (Figure 3.2-3). After gear up, the aircraft is climbed at constant equivalent airspeed, corresponding to V_2 + 10 KEAS, to the predetermined cutback altitude. At this altitude, the throttles are set to an EPR (Engine Pressure Ratio) corresponding to a percent of maximum takeoff thrust and a new climb gradient is established. The climb is continued at constant speed to about 9500 feet (ASL).

At the end of each segment, an interpolation is made for $N_1/\sqrt{\theta}$ using appropriately calculated values of EPR, Mach number, and pressure attitude. These parameters, plus downrange distance, are passed to the footprint routine for use in calculating noise along the flight path. A specific airport altitude and ambient temperature is assumed.

3.2.1 Brake Release to Rotation

This section describes the equations and data used in calculating the ground roll performance from brake release to rotation (Figure 3.2-1). The rotation speed (VR) is obtained from flight test data in the form of V_R/V_S (Figure 3.2-6) as a function of thrust to weight at liftoff $(T/W)_{lof}$. The distance equation from BR to ROT:

$$S_a = \frac{.04427\,(V_R^{\,2} - V_w^{\,2})}{T/W - \mu_r - \phi - \frac{KK}{C_{L_{rms}}}} \qquad (3.2\text{-}1)$$

is derived from the elementary equation of motion, assuming constant acceleration,

$$2\ aS = V^2_{final} - V^2_{original} \qquad (3.2\text{-}2)$$

All velocities used in distance equations are converted from equivalent airspeed to true airspeed by the following relationship:

$$V_T = \frac{V_e}{\sqrt{\sigma}} \qquad (3.2\text{-}3)$$

3.3.2 Rotation to Liftoff

The performance from rotation to liftoff is described in the same manner as for the previous segment. The liftoff speed is obtained from Figure 3.2-6. An acceleration from V_R to V_{lof} is made. The incremental distance covered is

$$S_r = \frac{.04427\ \left[(V_{lof} - V_w)^2 - (V_R - V_w)^2\right]}{T/W - \mu_r - \emptyset - \frac{KK}{C_{L_{rms}}}} \qquad (3.2\text{-}4)$$

3.2.3 Liftoff to 35 Feet

This segment begins at liftoff and covers the distance travelled during transition from ground run to a point where the aircraft has climbed to a height of 35 feet (AGL). The time (T_{clmb}) for this transition has been described by Flight Test as a function of the gradient (γ_{lof}) at liftoff (Figure 3.2-4). Once time has been determined, the climb distance equation

$$S_c = \left[\left[\frac{V_2(3) + V_{lof}}{2\sqrt{\sigma}}\right] - V_w\right] 1.6878\ T_{clmb} \qquad (3.2\text{-}5)$$

can be solved. This equation is derived from the following elementary equation:

$$\Delta S = \bar{V}\ \Delta T \qquad (3.2\text{-}6)$$

The incremental altitude is set at 35 feet.

3.2.4 35 Feet to Gear Up

This segment begins at 35 feet and includes the aircraft performance to the gear up point. The height at gear up (Figure 3.2-5) has been described by

Flight Test as a function of the gradient at liftoff. This height does not account for the increase in airspeed when accelerating from $V_2(3)$ to $V_2(2)$ + 10 KEAS. The program has an iterative routine that will reduce this height to account for the increase in true airspeed. The total time for gear up is based on 17.5 sec. (Reference 4) from liftoff to gear up. The segment time from 35 feet to gear up then becomes

$$T_{climb_{LOF\ to\ 35'}} + \Delta t_{35'\ to\ GU} = 17.5 \tag{3.2-7}$$

or

$$\Delta t_{35'\ to\ GU} = 17.5 - T_{climb_{LOF\ to\ 35'}} \tag{3.2-8}$$

3.2.5 Three Flight Options after Gear Up

3.2.5.1 Constant V_2 + 10 KEAS Climb After Gear Up

A constant EAS climb is considered the normal option for climb after gear up. Climb is established at a constant equivalent airspeed (V_2 + 10 KEAS) and continued to about 9500 feet (ASL) with the flap setting selected for takeoff. To establish the method for calculating incremental distance and height after gear up, time increment is fixed at 5 seconds and a graphical type integration is established. The incremental heights over 5 second intervals are summed until the pressure altitude exceeds 9500 feet (ASL). Basic equations used for each 5 second integration interval are as follows:

$$GRAD = \frac{T}{W} - \frac{D}{L} \tag{3.2-9}$$

$$R/C = \frac{1.6878\ \overline{V}_T}{(1 + .567\ M^2)} \left(GRAD - \frac{1.6878\ a}{32.2}\right) \tag{3.2-10}$$

$$\Delta H = 5\ ROC \tag{3.2-11}$$

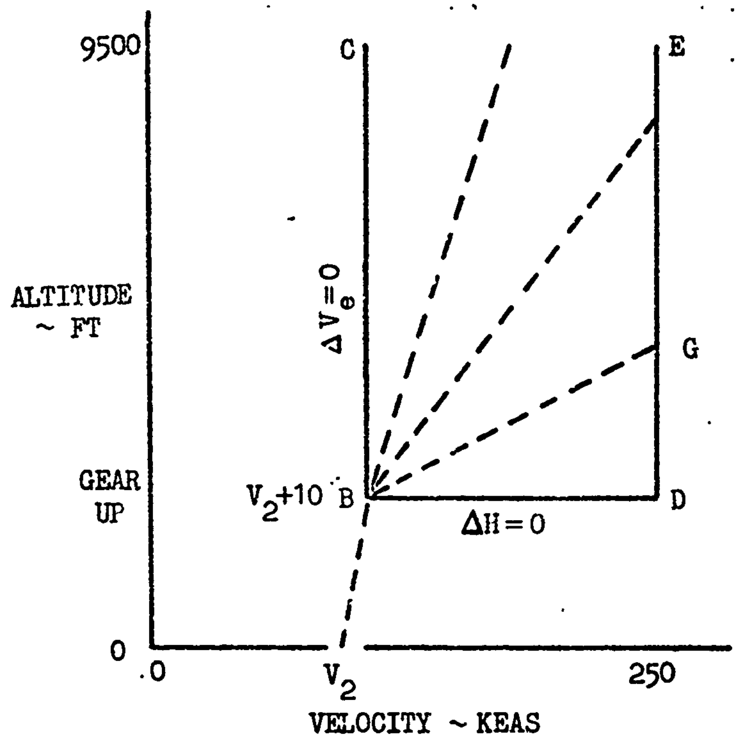
$$\Delta S_{Climb} = 1.6878\ T_{Climb}\ \overline{V}_T \tag{3.2-12}$$

3.2.5.2 Accelerated Climb After Gear Up

The accelerated climb path option starts at gear up, continues until either a 9500 foot pressure altitude is reached or speed reaches 250 KEAS. In the latter instance, the airplane is climbed at 250 KEAS until about 9500 pressure

altitude. Thus, a climb of about 9500 feet from a sea level airport or a climb of about 3500 feet from a 6000 foot airport is realized.

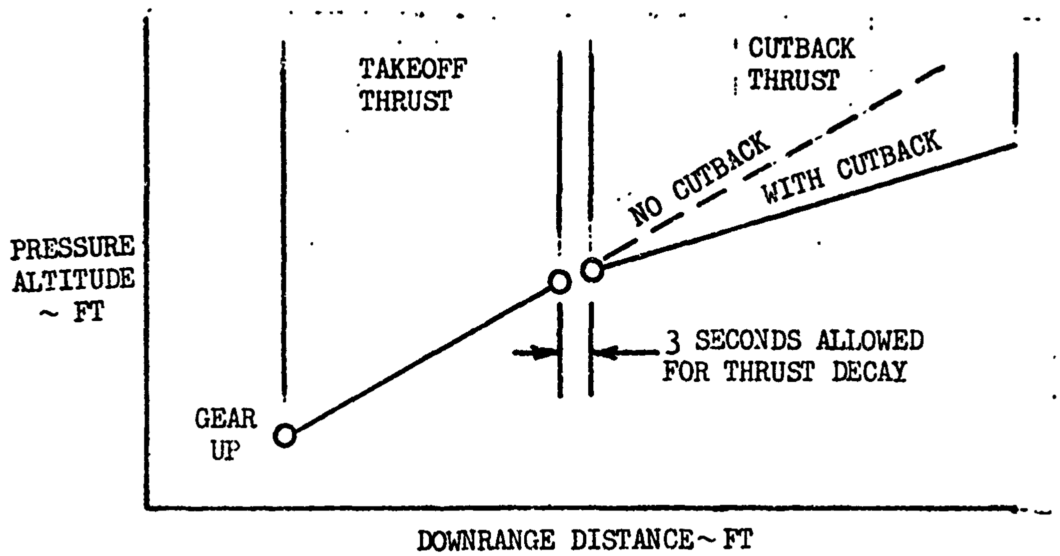
The basic logic for the acceleration option assumes that the total thrust after gear up can be divided between climb and acceleration. This is accomplished in the program by inputting a desired acceleration (KT/SEC) and then computing the resultant gradient and rate of climb. If a=0 is input, the program will automatically select a constant KEAS climb. Any acceleration between 0 and ∞ may be selected, but the program will limit the actual acceleration used for calculations to the maximum level-flight-acceleration capability of the airplane. The sketch below shows the limits of this option.



Path BC is a constant V_e (EAS) climb from gear up. Path BDE is a level flight acceleration to 250 KEAS followed by a constant 250 KEAS climb. Path BGE represents an intermediate climb where total thrust available is divided between climb and acceleration.

3.2.5.3 Thrust Cutback After Gear Up

Thrust cutback can be initiated at any point after gear up by inputting a cutback altitude (HT_{CB}) and a percent of thrust available (CB_{FAC}).



Any percent (decimal) of available thrust is allowed as input, but the program will limit actual thrust used for calculations to the thrust required for level flight at that point with a wing engine out. The program will calculate and print cutback thrust available, $N_1/\sqrt{\theta}$, and the corresponding cutback EPR setting. Climb is continued after thrust cutback at a reduced gradient and constant equivalent speed.

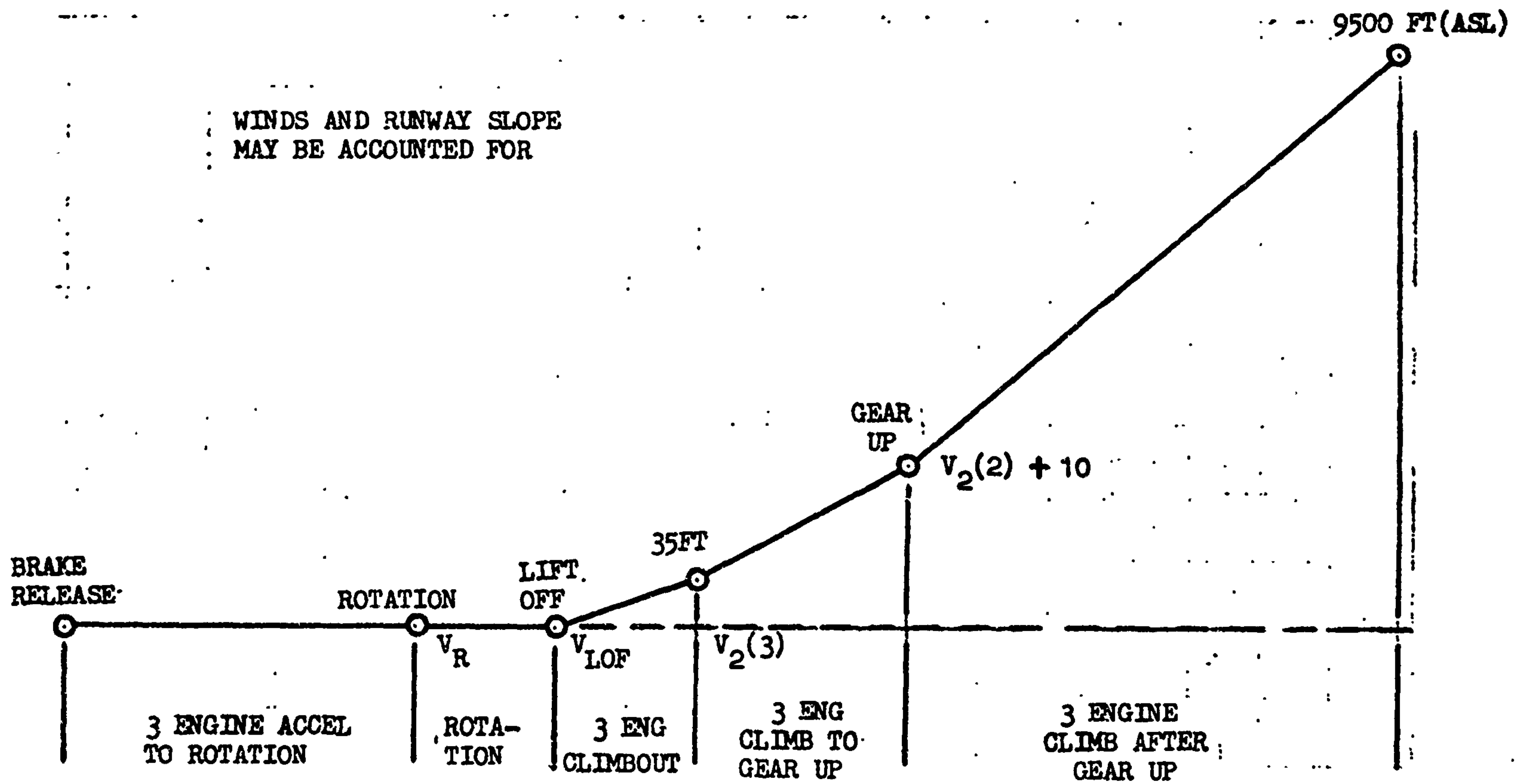


FIGURE 3.2-1 SCHEMATIC - 3 ENGINE TAKEOFF AND CLIMBOUT AT CONSTANT SPEED

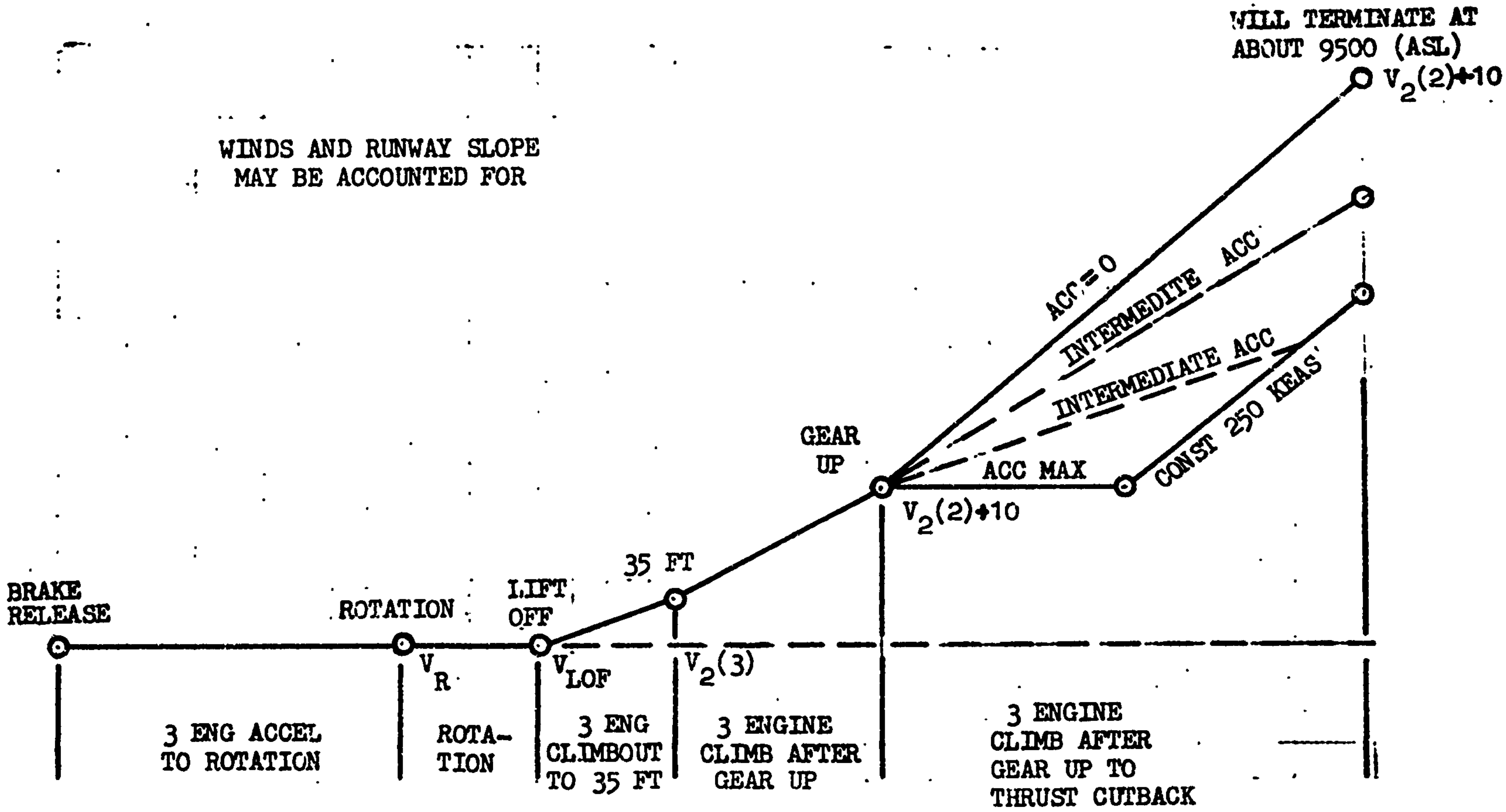


FIGURE 3.2-2 SCHEMATIC - 3 ENGINE TAKEOFF AND ACCELERATED CLIMB AFTER GEAR UP

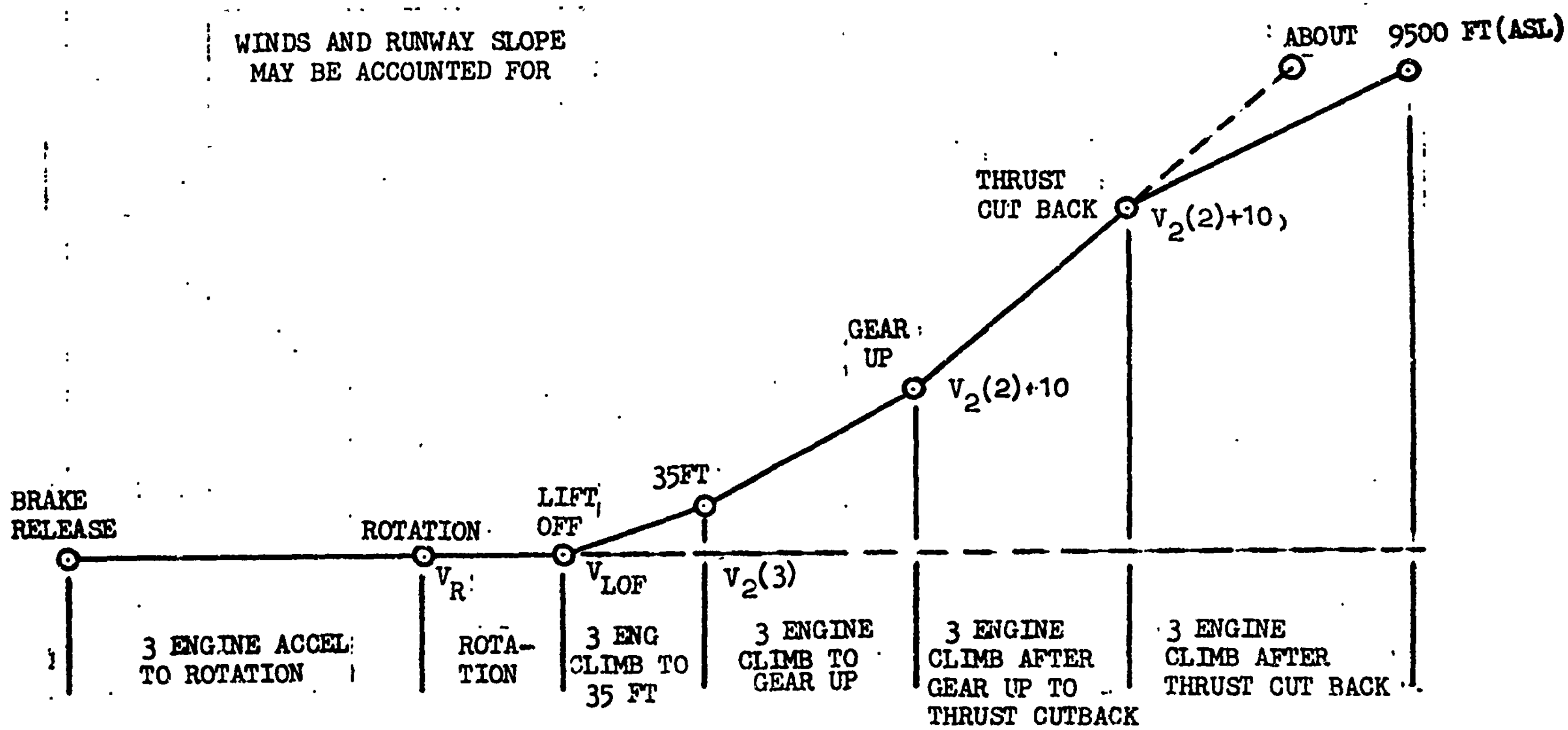


FIGURE 3.2-3 SCHEMATIC – 3 ENGINE TAKEOFF AND CLIMBOUT AT CONSTANT SPEED WITH THRUST CUTBACK AFTER GEAR UP

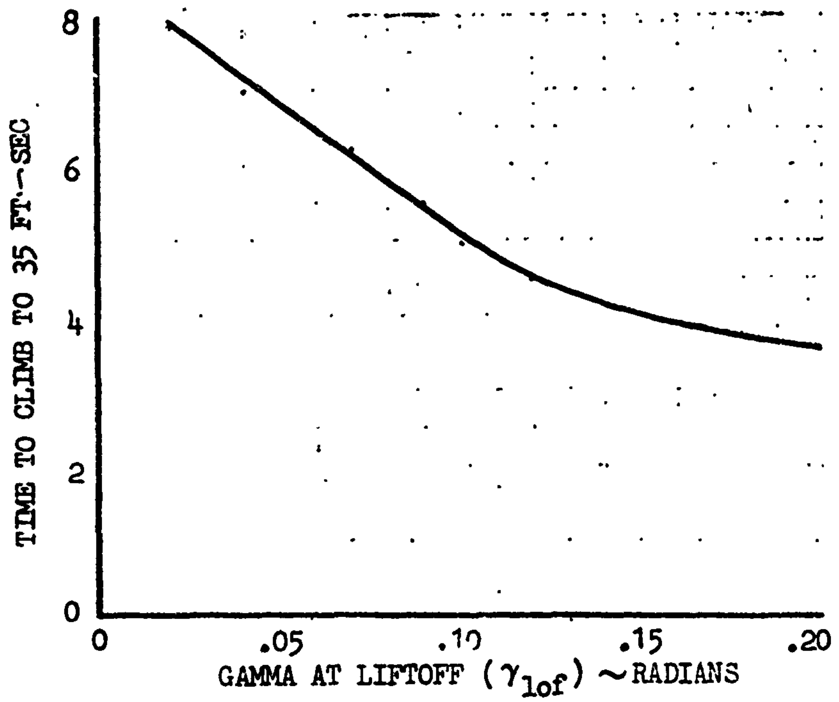


FIGURE 3.2-4 FLIGHT TEST TIME TO CLIMB FROM LIFTOFF TO 35 FEET

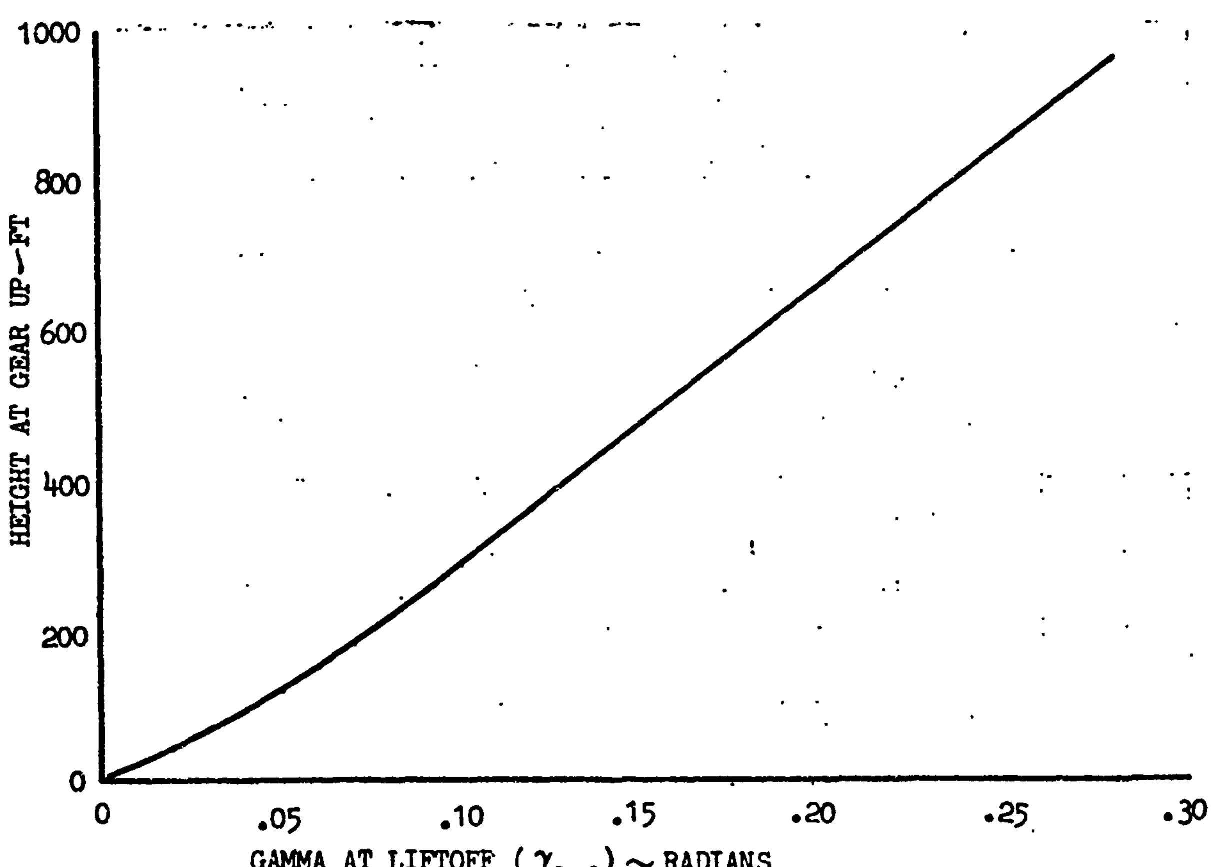


FIGURE 3.2-5 FLIGHT TEST GEAR UP HEIGHT

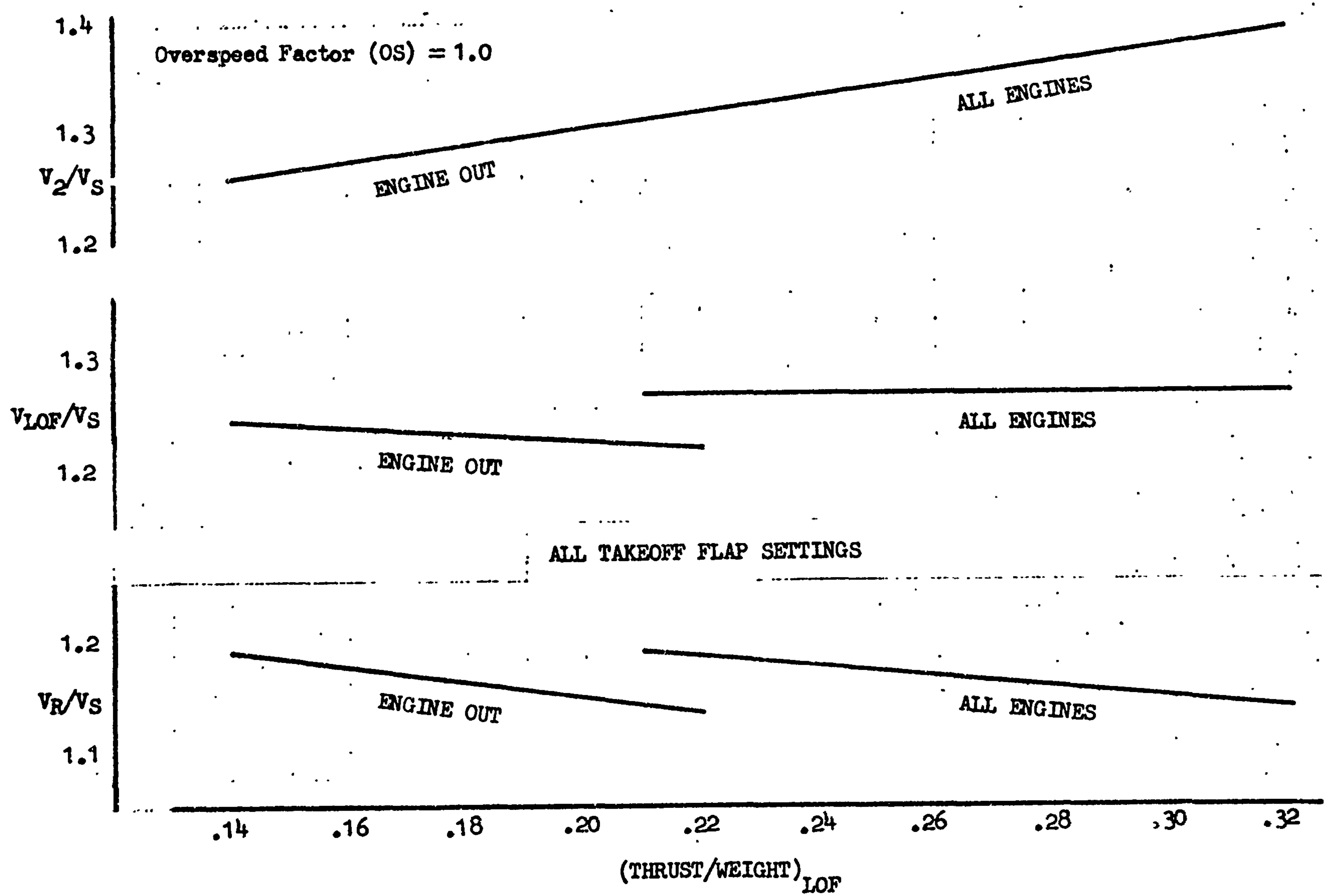
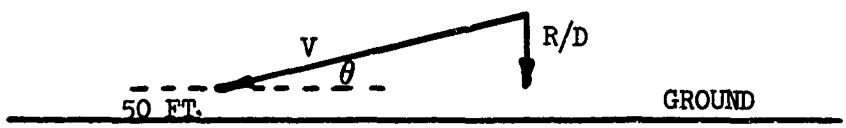


FIGURE 3.2-6 FLIGHT TEST TAKEOFF SPEED SCHEDULES

3.3 APPROACH PERFORMANCE

This section describes the method and equations that are used to calculate the basic engine thrust requirements that are one of the inputs required for the approach noise program. The "final approach" configuration to be used for this analysis consists of two flap deflections , 33 and 42 degrees, gear down and Direct Lift Control on or off. The airplane will proceed down a constant glide path angle at a constant calibrated airspeed. In the case of two segment approach procedures, instantaneous glide slope change is assumed with no manuevering load factors accounted for in the transition. The airplane aerodynamic data are based on FAA approved results as published in the FAA Type Certification report for the L1011-1 airplane (Reference 10).

The basic performance equations used to generate engine thrust for constant glide slope approach are as follows:



$$-\sin\theta = -\text{grad} = \frac{R/D}{V} = \frac{V \times \frac{FN-D}{W} \times \frac{1}{K.E.FACTOR}}{V}$$

$$= \frac{(FN-D)}{W} \times \frac{1}{K.E.FACTOR} \qquad (3.3\text{-}1)$$

(NO WIND)

where:

θ = approach path angle.

grad = gradient.

R/D = Rate of Descent.

V = airplane velocity.

F_N = Engine thrust.

D = airplane drag.

K.E. Factor = Kinetic Energy Factor dependent on velocity change.

W = airplane weight.

The basic noise program has been written for an approach speed defined as $1.3V_S + 10$ (KEAS) and zero winds, which corresponds with conditions set up for FAA noise certification. Since the airplane approaches at a constant calibrated airspeed, the required engine thrust for maintaining a constant angle of glide is independent of airplane altitude.

The effect of winds on engine thrust required is shown by the following equations

$$- \sin\theta = -\text{grad} = \frac{R/D}{V_{GROUND}}$$

$$-\text{grad} = -\frac{V_{AIR}}{V_{GROUND}} \times \frac{FN-D}{W} \times \frac{1}{\text{K.E. FACTOR}_{(WIND)}} \qquad (3.3\text{-}2)$$

where: $V_{GROUND} = V_{AIR} - V_{WIND}$

With the use of the above equations and the flight path profile generated by the trigonometric relation of the glide angle, engine thrust required on the approach is calculated and submitted as an input to the noise program.

3.4 NOISE FOOTPRINT

The noise footprint subroutine has the capability to calculate the coordinates (x and w) of equal noise points on a flat terrain, and to plot constant noise contours through these points. In addition, the noise levels directly under the airplane flight path and at one-quarter nautical mile to either side thereof are calculated. As the coordinates are calculated, the area enclosed by the contour to that point is also calculated. A plotting routine is used to provide machine plots of the contours.

The footprint calculation utilizes the output of the performance subroutine to describe the airplane flight path and tables of noise values extracted from the noise propagation subroutine. If desired, flight path information may be entered directly into the footprint routine without using the performance subroutine. The noise propagation data used are with full extra ground attenuation and without any extra ground attenuation. The transition from one extreme to the other in the footprint calculation depends on the angle of elevation, β, of the noise path to the ground point utilizing the factor $e^{-\sqrt{\tan 3\beta}}$ from Reference 11.

3.4.1 Footprint Input Parameters

Footprint input parameters include the following: a table of noise levels versus distance and versus corrected fan speed $(N_1/\sqrt{\theta})$ for a specific airport altitude and temperature; a maximum-noise radiation angle; the noise level values for which contours are desired; flight profile data; and an initial point and associated distance increment for augmentation of the flight profile data.

The noise level table includes data both with extra ground attenuation and without. The flight profile data consist of airplane altitude (H) above flat ground, true air speed, and corrected fan speed, all as functions of distance along the flight path projection on the ground. The initial point and distance increment input permits augmentation of the flight profile data while entering a minimum number of points to define the flight path. If the number of points defining the path is considered adequate, the initial point may be picked beyond the termination of the flight profile and no additional points will be calculated.

3.4.2 Footprint Calculation

To obtain the required resolution for contour plotting, the input flight profile usually is augmented by adding more points by linear interpolation between the profile points from the performance subroutine. The input points are also included in the generated flight path.

As the augmented flight path is being generated, the noise levels under the flight path (on the extended runway centerline) and on the quarter mile sidelines are found. The centerline level, L_C, is found by interpolating with $LOG_{10}H$ and $N_1/\sqrt{\theta}$ in the noise data without EGA. The equation $X' = X + H \cot \theta$ is used to calculate the intercept on the ground. The quarter nautical mile sideline level, L_S, is found in a similar manner except the interpolation to find L_1 and L_2 is with $LOG_{10}R$ instead of $LOG_{10}H$, where

$$R = \sqrt{H^2 + 1520^2} \quad \text{feet} \qquad (3.4\text{-}1)$$

L_1 and L_2 are the levels at R with and without EGA, respectively. Accordingly,

$$L_s = L_2 - (L_2 - L_1)\, e^{-\sqrt{\tan 3\beta}} \quad \text{dB} \qquad (3.4\text{-}2)$$

where

$$\beta = \arcsin (H \sin \theta / R) \quad \text{degrees} \qquad (3.4\text{-}3)$$

Note: If $\beta > 30^\circ$, then β is set to 30°.

Here, the equation $X'' = X + R \cot \theta$ gives the intercept on the ground for the sideline noise.

In each of the above cases, if the level is an EPNL, a velocity correction tc the duration must be made. It has the form $C = 10 \text{ LOG } (160/V)$, and is added to the levels found above.

For each noise level for which a contour is required, the distances R_1 and R_2 must be found using inverse interpolation in the noise data table with entry of $LOG_{10} R_j$ $(j = 1,2)$ for each $N_1/\sqrt{\theta}$. The distance R_1 and R_2 are without EGA and with EGA, respectively. This will result in tables of R_1 and R_2 versus $N_1/\sqrt{\theta}$ for each level. Then for each point on the flight path,

$$R = \text{antilog } (LOG_{10} R_1 - (LOG_{10} R_1 - LOG_{10} R_2)\, e^{-\sqrt{\tan 3\beta}} \quad \text{feet} \qquad (3.4\text{-}4)$$

where

R_1 and R_2 are found by interpolating with a specific value of $N_1/\sqrt{\theta}$

If the levels are EPNL, a velocity correction must be made for the duration. In this instance it is $160/V$ and multiplies the distance R_1 and R_2 above. The contour's half width, W, then, is $\sqrt{R^2 - H^2}$. The distance along the flight path to the point on the contour is

$$X' = X + R \cot\theta \qquad \text{ft.} \qquad (3.4\text{-}5)$$

The area enclosed by a contour is calculated using trapezoidal rule quadrature. This equation is

$$\text{Area}_i = \text{Area}_{i-1} + 3.587 \times 10^{-8} (X'_i - X'_{i-1}) (W_i + W_{i-1}) \text{ sq.mi.} \qquad (3.4\text{-}6)$$

The constant 3.587×10^{-8} evolves from

$$3.587 \times 10^{-8} = \frac{0.5 \times 2}{(5280)^2}$$

where 0.5 accounts for the application of the trapezoidal rule and the 2 accounts for both sides of the centerline. The $\frac{1}{(5280)^2}$ accounts for the conversion from square feet to square miles. An example of a contour plot is included in Section 4, following.

3.5 FLOW DIAGRAM

This section presents a generalized flow diagram of the logic of the Noise Definition Program. The major options in the program are shown as distinct routes or paths in the logic.

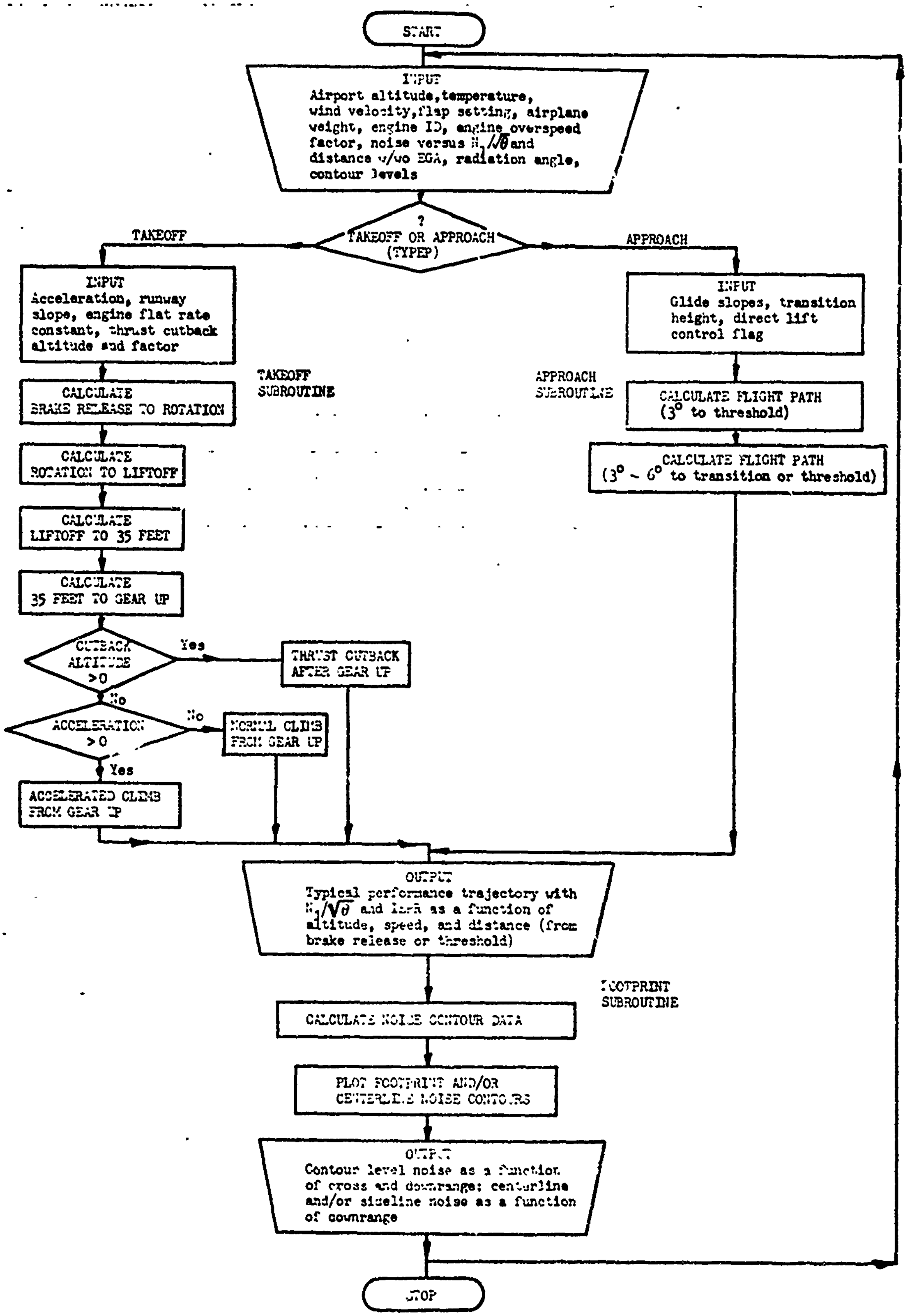


FIGURE 3.5-1 FLOW DIAGRAM OF THE NOISE DEFINITION PROGRAM

SECTION 4

PROGRAM APPLICATION

Representative ways of using the Noise Definition Program and its sister program, the Noise Propagation Program, are presented in Section 4. Section 4.1 presents data which substantiate the mathematical model of the Noise Definition Program with respect to comparison with measured flight test data for both the takeoff climb profile and noise at the 3.5 n. mi. downrange point. The programs are put to use to exercise their full capabilities. Typical sample input and output is presented in Section 4.2.

4.1 SUBSTANTIATION WITH FLIGHT TEST DATA

The noise data used are from the L-1011 noise certification flights made on 4, 5 March 1972. The approach data were measured on 4 March and covered a range of $N_1/\sqrt{\theta}$ from 55.8% to 70.8% at an approach altitude of approximately 340 feet above the microphone. The takeoff data were measured on 5 March and covered a range of altitude from about 1200 feet to 1800 feet at a takeoff $N_1/\sqrt{\theta}$ of approximately 90%. It was shown in the certification report (Reference 4) that there were no tone corrections, only pseudo tone corrections caused by the rapid fall off of the spectra at the high frequency end at great distances and by irregularities in the spectra at the low frequency end due to ground reflections. These were ignored.

The noise data in the form of one-third octave band spectra were normalized to 200 feet, FAR 36 day, using the methods of FAR Part 36 (Reference 3). These spectra were then fitted to a curve versus $N_1/\sqrt{\theta}$ to produce spectra at 5% increments of $N_1/\sqrt{\theta}$ over the range from 55% to 95%. The spectra were then modified to the various ambient conditions and attenuation incorporated to produce tables of noise versus distance $N_1/\sqrt{\theta}$ for the various ambient conditions.

The approach performance routine was based on the flight test methods and data (Reference 10) page 4.0.I-3-2-2, 4.0.I-3-7-2, 4.0.I-3-7-3. For the conditions of

Landing Weight	358000 lb.
Flaps	42 degrees
Glide slope	3 degrees
Approach speed $1.3V_S + 10$	149.6 KEAS
Airport Temperature	77° F
Airport Elevation	Sea Level,

as seen in Figure 4.1-4, the noise level was found to be 102.70 EPNdB at the one nautical mile point. The certification value for approach was 103 EPNdB for these conditions.

The takeoff flight test noise certification profile for the L-1011-1 with RB.211-22B engines is outlined in Reference 12. The conditions for this profile are:

Takeoff Weight	430,000 lb.
Flaps	10 degrees
Bleeds	Off
Climb after gear up @ $V_2 + 10$	174.0 KEAS
Airport Temperature	77° F
Airport Elevation	Sea Level

Figure 4.1-2 shows computer output for the conditions outlined above. A side by side tabular comparison of the important variables is shown in Figure 4.1-3 and a graphical comparison is made in Figure 4.1-1. It can be seen by this comparison that the performance subroutine of the combined noise prediction program matches flight test data within a very small tolerance.

It was shown in the certification report that around 90% $N_1/\sqrt{\theta}$, the variation of noise with $N_1/\sqrt{\theta}$ was negligible. Using the altitude from the above takeoff profile at the 3.5 nautical mile point the value of 96.18 EPNdB was obtained. The certification value for this condition was 96 EPNdB.

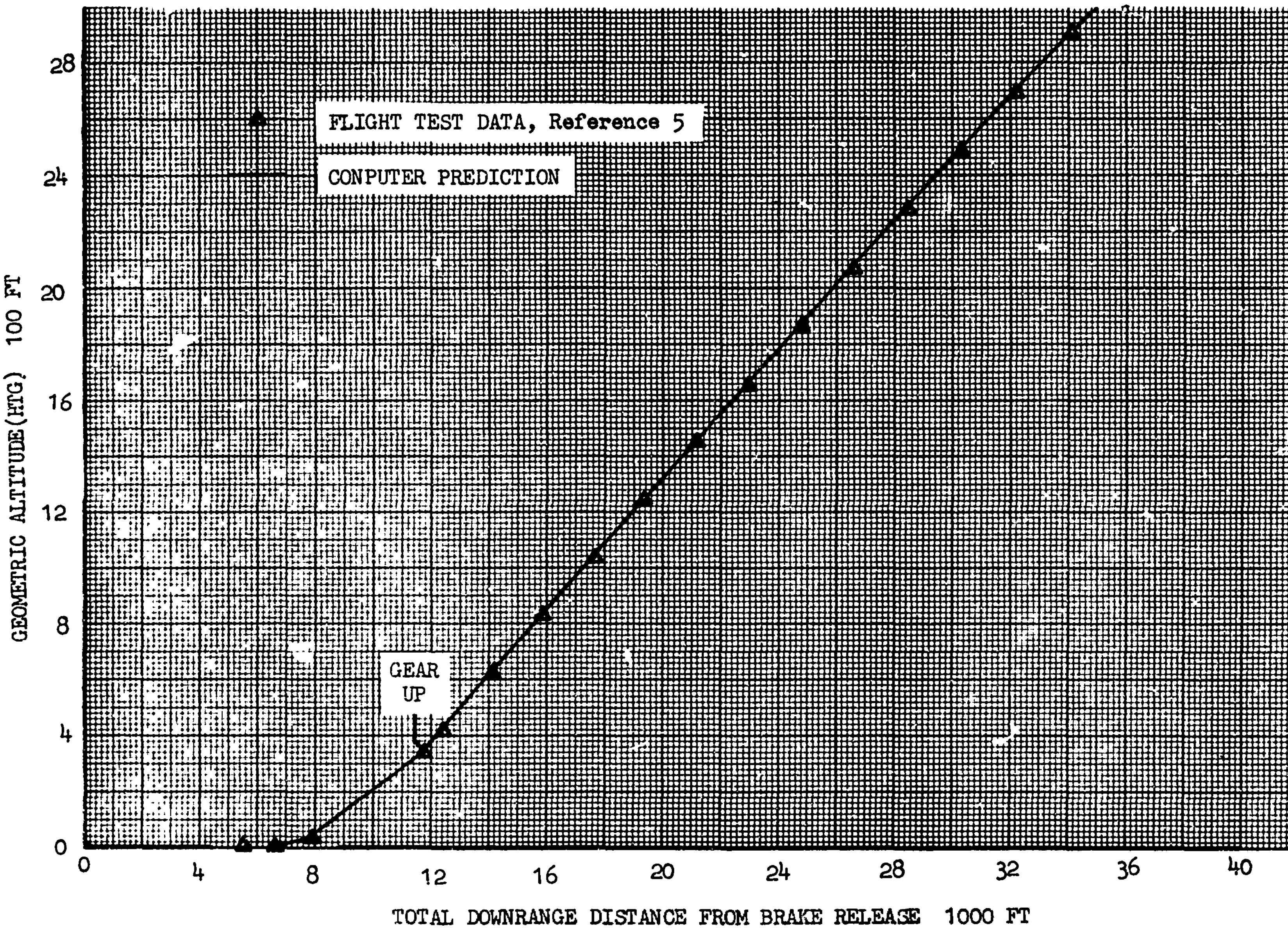


FIGURE 4.1-1 NORMAL TAKEOFF FLIGHT PATH COMPARISON WITH FLIGHT TEST - GRAPHICAL

MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST   08-10-74   PAGE 6

FLAP=10. DEG   TEMP= 77.0 DEG F   WIND= 0.0 KT   SLOPE=0.0   ACCL = 0.0 KT/SEC

HP= 0. WEIGHT= 410000. IEPR= 1.533 ISA+ 10.0 DEG C. RB.211-22B BLEED OFF

SEGMENT	PRESSURE ALTITUDE (FT)	GEOMETRIC ALTITUDE (FT)	TOTAL DISTANCE (FT)	TOTAL TIME (SEC)	THRUST (LB)	SPEED (KTAS)	MACH	ALPHA (DEG)	PITCH (DEG)	GRAD	TEMP (DEG F)	IEPR	N1/ SQRT(THETA) (PCT)	ROC (FPM)	FLAP (DEG)
35-RCT	0.	0.	5519.	43.1	32076.	156.7	.243	****	****	****	77.0	1.521	92.41	*****	10.
ROT-LOF	0.	0.	6579.	47.0	31643.	167.1	.248	****	****	****	77.0	1.519	92.41	*****	10.
LOF-35FT	34.	35.	7870.	51.5	31333.	174.1	.259	****	****	****	76.9	1.519	92.43	*****	10.
35F-GU	332.	344.	10739.	64.5	31008.	177.9	.265	****	****	****	75.8	1.520	92.66	*****	10.
GU+XXXX	662.	706.	14791.	74.5	30769.	178.9	.266	11.6	18.3	.116	74.6	1.523	92.94	2095.	10.
GU+XXXX	1029.	1065.	17777.	84.5	30531.	179.8	.268	11.6	18.2	.114	73.3	1.526	93.21	2075.	10.
GU+XXXX	1362.	1420.	20819.	94.5	30292.	180.7	.270	11.6	18.1	.112	72.1	1.529	93.48	2056.	10.
GU+XXXX	1713.	1773.	23877.	104.5	30054.	181.6	.271	11.6	18.0	.111	70.9	1.532	93.75	2036.	10.
GU+XXXX	2049.	2121.	[illegible]	114.5	29814.	182.5	.273	11.6	17.9	.109	69.7	1.534	94.01	2016.	10.
GU+XXXX	2383.	2467.	30037.	124.5	29565.	183.5	.275	11.6	17.8	.107	68.5	1.537	94.25	1994.	10.
GU+XXXX	2712.	2808.	33143.	134.5	29319.	184.4	.277	11.6	17.7	.106	67.3	1.539	94.49	1972.	10.
GU+XXXX	3038.	3146.	[illegible]	144.5	29077.	[illegible]	.278	11.6	17.6	.104	66.2	1.542	94.74	1950.	10.
GU+XXXX	3361.	3480.	39397.	154.5	28839.	186.2	.280	11.6	17.5	.102	65.0	1.544	94.99	1929.	10.
GU+XXXX	3675.	3810.	42547.	164.5	28604.	187.1	.281	11.6	17.4	.101	63.9	1.547	95.24	1907.	10.
GU+XXXX	3995.	4137.	45712.	174.5	28372.	188.0	.283	11.6	17.3	.099	62.8	1.549	95.50	1886.	10.
GU+XXXX	4306.	4460.	48894.	184.5	28142.	188.9	.285	11.6	17.2	.098	61.6	1.551	95.74	1865.	10.
GU+XXXX	4614.	4783.	52087.	194.5	27915.	189.7	.286	11.6	17.1	.096	60.5	1.554	95.99	1843.	10.
GU+XXXX	4919.	5096.	55297.	204.5	27692.	190.6	.288	11.6	17.1	.095	59.5	1.556	96.24	1822.	10.
GU+XXXX	5220.	5408.	58522.	214.5	27472.	191.5	.290	11.6	.7.0	.093	58.4	1.558	96.49	1801.	10.
GU+XXXX	5518.	5717.	61761.	224.5	27256.	192.4	.291	11.6	16.9	.091	57.3	1.561	96.74	1781.	10.
GU+XXXX	5812.	6022.	65016.	234.5	27043.	193.3	.293	11.6	16.8	.090	56.3	1.563	96.99	1760.	10.
+XXXX	6103.	6324.	68285.	244.5	26831.	194.1	.295	11.6	16.7	.089	55.2	1.565	97.24	1739.	10.
+XXXX	6390.	6622.	71568.	254.5	26619.	195.0	.296	11.6	16.6	.087	54.2	1.567	97.49	1718.	10.
XXXX	6674.	6916.	74866.	264.5	26412.	195.8	.298	11.6	16.6	.086	53.2	1.569	97.74	1679.	10.
.XXXX	6954.	7207.	78175.	274.5	26212.	196.7	.299	11.6	16.5	.084	52.2	1.571	97.99	1677.	10.
U+XXXX	7231.	7495.	81505.	284.5	26016.	197.5	.301	11.6	16.4	.083	51.2	1.573	98.24	1658.	10.
GU+XXXX	7505.	7780.	[illegible]	294.5	25826.	198.4	.302	11.6	16.3	.082	50.2	1.576	98.48	1638.	10.
GU+XXXX	7775.	8061.	88201.	304.5	25641.	199.2	.304	11.6	16.2	.080	49.3	1.578	98.72	1620.	10.
GU+XXXX	8043.	8339.	91570.	314.5	25461.	200.0	.306	11.6	16.2	.079	48.3	1.580	98.97	1601.	10.
GU+XXXX	8303.	8614.	94954.	324.5	25286.	200.9	.307	11.6	16.1	.078	47.4	1.582	99.21	1583.	10.
GU+XXXX	8570.	8886.	98351.	334.5	25115.	201.7	.309	11.6	16.0	.077	46.5	1.584	99.45	1566.	10.
GU+XXXX	8826.	9155.	101762.	344.5	24949.	202.5	.310	11.6	16.0	.076	45.5	1.586	99.70	1549.	10.
GU+XXXX	9084.	9421.	105187.	354.5	24788.	203.3	.312	11.6	15.9	.074	44.6	1.589	99.95	1532.	10.
GU+XXXX	9338.	9684.	108626.	364.5	24631.	204.1	.313	11.6	15.8	.073	43.7	1.591	100.19	1516.	10.
GU+XXXX	9588.	9945.	112076.	374.5	24478.	205.0	.315	11.6	15.8	.072	42.8	1.593	100.44	1500.	10.

ACC = 0.0 KT/SEC   CURAC USED = 0.0

FIGURE 4.1-2 NORMAL TAKEOFF FLIGHT PATH

COMPARISON WITH FLIGHT TEST

430,000 Lb	RB.211-22B	
Flaps 10 Deg	ISA + 13.9° Rating	
Sea Level	Bleed Off	
77°F	Flt Test	Computed
EPR @ 60 KTS	1.533	1.533
V_R	154 KEAS	154
V_{LOF}	164.3 KEAS	164.3
V_2 (3 Eng)	171.1 KEAS	171.1
V_2 (2 Eng) + 10 KEAS	174.0 KEAS	174.0

	Geometric Altitude (Ft)		Total Distance (Ft)	
Segment	Flight Test	Computer	Flight Test	Computer
BR - ROT	0	0	5546	5515
ROT - LOF	0	0	6619	6575
LOF - 35 Ft.	35	35	7905	7870
35 Ft - GU	340	344	11775	11739
GU - 414	414	422	12390	12390
H_p = 200 Ft.	621	628	14109	14109
	828	840	15843	15843
	1035	1054	17592	17592
	1242	1249	19357	19357
	1449	1455	21138	21138
	1656	1664	22934	22934
	1863	1868	24747	24747
	2070	2078	26576	26576
	2278	2285	28422	28422
	2485	2493	30286	30286
	2692	2700	32166	32166
	2899	2908	34065	34065
	3106	3115	35981	35981
	3314	3323	37916	37916

FIGURE 4.1-3 NORMAL TAKEOFF FLIGHT PATH COMPARISON WITH FLIGHT TEST - TABULAR DATA

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

NOISE LEVELS ALONG THE FLIGHT PATH

X	H	V	A1/ SQRT(THETA)	XP	LCL	R	XPP	LSL
0.	50.	152.3	66.27	0.	114.31	1521.	0.	82.68
6080.	170.	153.0	66.61	6080.	107.70	1564.	6080.	86.40
12160.	688.	153.7	66.94	12160.	98.35	1669.	12160.	88.55
18240.	1006.	154.4	67.27	18240.	95.27	1823.	18240.	89.73
24320.	1325.	155.1	67.60	24320.	92.84	2016.	24320.	88.82
26080.	1417.	155.3	67.69	26080.	92.25	2078.	26080.	88.55
30400.	1643.	155.8	67.92	30400.	90.93	2238.	30400.	87.89
36480.	1961.	156.5	68.24	36480.	89.27	2441.	36480.	86.96
42560.	2279.	157.2	68.55	42560.	87.89	2740.	42560.	86.09
46080.	2464.	157.7	68.73	46080.	87.18	2795.	46080.	85.61
48640.	2598.	158.0	68.86	48640.	86.71	3010.	48640.	85.27
54720.	2919.	158.7	69.18	54720.	85.60	3290.	54720.	84.49
60800.	3237.	159.4	69.51	60800.	84.76	3576.	60800.	83.72
66080.	3515.	160.1	69.78	66080.	84.00	3829.	66080.	83.10
66880.	3557.	160.2	69.82	66880.	83.89	3868.	66880.	83.01
72960.	3876.	160.9	70.15	72960.	83.08	4164.	72960.	82.33
79040.	4196.	161.6	70.47	79040.	82.32	4462.	79040.	81.67
85120.	4515.	162.4	70.79	85120.	81.62	4764.	85120.	81.06
91200.	4835.	163.1	71.11	91200.	80.97	5068.	91200.	80.48
97280.	5154.	163.9	71.43	97280.	80.37	5374.	97280.	79.94
103360.	5474.	164.6	71.76	103360.	79.81	5681.	103360.	79.43
109440.	5793.	165.3	72.08	109440.	79.29	5989.	109440.	78.95
115520.	6113.	166.1	72.40	115520.	78.80	6299.	115520.	78.49

FIGURE 4.1-4 NORMAL APPROACH - NOISE LEVELS ALONG FLIGHT PATH

4.2 TYPICAL PROGRAM USE - SAMPLE CASES

Included here are sample runs of the Noise Propagation Program and the Noise Definition Program including the input and sample plots.

4.2.1 Noise Data Generation - Noise Propagation Program

Shown here are three cases run on the Noise Propagation Program: one showing the averaging of flight test data from Reference 4, the next showing an input of previously averaged data and the third showing multiple output conditions. Figure 4.2-1 shows the input listings for these three cases and Figure 4.2-2a through u shows the tabulated output. An example of plotted noise propagation results - effective perceived noise level versus distance, normalized to 160 knots, on a FAR Part 36 reference day - is shown as Figure 4.2-3.

```
00  81420 3.                                                                             101
100.     200.     370.     800.     1600.    3200.    6400.    12800.                    102
 TEST CASE - 6 05/73 VERSION                                                             103
  RADIAL DIS. HCF                                                                        104
59.5     62.      27.435   3.       318.     71.46    141.     -5.55                     105
 SPECTRUM # 1                                                                            106
82.75    76.88    76.68    84.17    91.04    93.38    82.65    86.33    85.01            107
85.06    84.73    85.C7    82.47    81.91    82.58    81.6     81.78    83.25            108
83.47    81.56    80.46    78.C5    75.32    69.78                                       109
59.5     62.      27.435   3.       318.     71.56    141.     -6.47                     110
 SPECTRUM # 2                                                                            111
83.75    78.96    73.09    82.CC    91.35    94.14    84.97    85.57    87.C9            112
84.56    85.40    85.66    82.83    92.17    84.02    83.21    82.82    84.08            113
84.41    82.17    81.C7    78.55    74.86    70.13                                       114
59.5     62.0     27.435   3.       360.     55.11    141.     -6.02                     115
SPECTRUM # 3                                                                             116
82.65    78.34    71.10    81.C2    92.36    91.53    84.63    83.76    85.52            117
84.69    85.11    87.11    82.26    91.41    83.67    81.85    83.05    86.17            118
84.32    85.50    81.99    78.55    75.44    70.66                                       119
59.5     62.0     27.435   3.       318.     71.56    141.     -6.01                     120
SPECTRUM # 4                                                                             121
82.5C    76.71    74.96    82.28    91.18    93.07    84.30    84.99    86.00            122
84.95    85.91    85.C8    81.74    81.41    83.44    82.62    82.00    83.76            123
83.88    82.23    81.17    76.C4    75.03    70.32                                       124
99999.                                                                                   125
0.       10.      70.                                                                    126
01  81420 3.                                                                             201
100.     200.     370.     800.     1600.    3200.    6400.    12800.                    202
 TEST CASE - 06/05/73 VERSION                                                            203
 CERTIFICATION   DATA     TAKEOFF       SIDELINE DISTANCE                                204
77.      70.      29.9213  3.       200.     88.12    160.     -10.05                    205
SPECTRUM # 1                                                                             206
93.29    97.93    98.90    97.8C    100.85   101.47   96.89    99.64    101.09           207
99.37    97.72    97.45    96.23    95.90    96.78    95.73    97.65    96.50            208
95.84    94.99    91.36    88.6C    85.12    83.19                                       209
99999.                                                                                   210
0.       10.      70.                                                                    211
01  81420 3.                                                                             301
100.     200.     370.     800.     1600.    3200.    6400.    12800.                    302
                    L-1011-1 / RB211-22B / -22C                                          303
      CERTIFICATION DATA       FAR POWER        (NI/SQRT(THETA)=55%)                     304
77.      70.      29.92    3.       200.     85.46    160.     -8.367                    305
      FAIRED SPECTRA                                                                     306
   84.44    79.32    76.0C    86.05    90.81    88.56    84.63    85.39    87.80         307
   87.77    84.27    87.39    85.19    86.00    85.53    83.89    84.53    85.15         308
   83.72    82.76    81.36    78.56    77.98    72.49                                    309
99999.                                                                                   310
0.       10.      70.                                                                    311
11 -81420 3.                                                                             312
0.       -71.666670.                                                                     313
```

FIGURE 4.2-1 SAMPLE PROGRAM INPUT NOISE PROPAGATION PROGRAM

```
CASE #74224.1347442R

 TEST CASE - 6/05/73 VERSION
  RADIAL DISTANCE

 SPECTRUM # 1

TEMPERATURE =  59.50      RELATIVE HUMIDITY = 62.00       PRESSURE =  27.4      NO. OF ENGINES FOR INPUT = 3.
RADIAL DISTANCE =  318.        RADIATION ANGLE =  72.0       AIRCRAFT VELOCITY =141.00      DURATION CORRECTION = -5.55

CHECK
   32.75   76.84   76.88   84.17   91.94   93.38   82.65   86.33   85.01   85.06   84.73   85.67
   92.47   81.91   82.58   81.63   81.78   83.25   83.47   81.56   80.46   78.09   75.02   69.78

OASPL = 58.90 DB,  SOUND LEVEL = 94.15 DBA,  PNL =108.74 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =138.74 TPNDB, EPNL =103.19 EPNDB

OCTAVE SPECTRA      84.56   56.02   89.69   84.73   87.10   87.05   86.78   80.24

1/3 OCTAVE BAND SPL'S @200 FT. CORRECTED TO FAR DAY.

   86.65   89.78   83.78   88.08   95.85   97.29   86.57   90.25   88.94   68.99   88.67   89.63
   86.44   85.90   86.63   85.66   85.92   87.54   87.99   86.53   85.69   84.16   62.41   78.55

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. = -7.49

OASPL =102.96 DB,  SOUND LEVEL = 91.50 DBA,  PNL =113.30 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =113.30 TPNDB, EPNL =105.40 EPNDB

OCTAVE SPECTRA      83.46   59.93   93.61   93.67   91.10   91.23   91.61   87.11

 SPECTRUM # 2

TEMPERATURE =  59.50      RELATIVE HUMIDITY = 62.00       PRESSURE =  27.4      NO. OF ENGINES FOR INPUT = 3.
RADIAL DISTANCE =  318.        RADIATION ANGLE =  72.0       AIRCRAFT VELOCITY =141.00      DURATION CORRECTION = -6.47

CHECK
   93.75   78.96   73.09   82.51   91.35   94.14   84.97   85.57   87.09   84.56   85.40   85.66
   82.43   82.17   84.02   83.21   82.32   84.00   84.41   82.17   81.07   78.55   74.66   70.13

OASPL = 99.35 DB,  SOUND LEVEL = 94.94 DBA,  PNL =109.46 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =109.46 TPNDB, EPNL =102.99 EPNDB

OCTAVE SPECTRA      85.27   96.17   90.74   90.00   87.85   88.17   87.55   80.51

1/3 OCTAVE BAND SPL'S @200 FT. CORRECTED TO FAR DAY.

   87.65   92.60   76.99   86.51   95.26   96.05   86.89   89.49   91.02   88.49   89.34   89.62
   86.80   86.16   88.04   87.27   86.96   88.37   86.93   87.11   86.30   84.62   82.25   79.30

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. = -6.81

OASPL =103.41 DB,  SOUND LEVEL = 94.26 DBA,  PNL =114.01 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =114.01 TPNDB, EPNL =105.20 EPNDB

OCTAVE SPECTRA      85.17  100.69   94.66   93.95   91.84   92.35   92.36   87.35
```

FIGURE 4.2-2a SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.1147442R

 TEST CASE - 6/04/73 VERSION
 RADIAL DISTANCE

SPECTRUM # 3

TEMPERATURE =  56.50      RELATIVE HUMIDITY = 62.00       PRESSURE =  27.4      NO. OF ENGINES FOR INPUT = 3.
RADIAL DISTANCE =  369.       RADIATION ANGLE =  55.1      AIRCRAFT VELOCITY =141.00      DURATION CORRECTION = -6.02

CHECK
   82.69   76.34   71.10   81.02   92.56   91.53   84.63   83.76   85.52   84.08   85.11   84.11
   32.26   81.41   83.67   81.86   83.05   86.17   84.32   83.50   81.99   78.55   75.44   70.66

OASPL = 98.68 DB,  SOUND LEVEL - 94.95 DBA,  PNL =109.61 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =109.61 TPNDB, EPNL =103.59 EPNDB

OCTAVE SPECTRA      84.26   55.15   89.47   89.42   87.32   88.86   88.15   80.73

1/3 OCTAVE BAND SPL'S 4200 FT. CORRECTED TO FAR DAY.

   86.60   82.25   75.01   84.94   96.28   95.45   88.56   87.69   89.46   88.63   89.07   88.08
   86.25   85.43   87.72   85.55   87.24   90.53   88.95   88.62   87.45   84.98   83.40   80.69

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. = -8.37

OASPL =102.84 DB,  SOUND LEVEL = 99.45 DBA,  PNL =114.20 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =114.20 TPNDB, EPNL =105.83 EPNDB

OCTAVE SPECTRA      88.17   95.07   93.40   93.38   91.34   93.12   93.16   38.14

SPECTRUM # 4

TEMPERATURE =  59.50      RELATIVE HUMIDITY = 62.00       PRESSURE =  27.4      NO. OF ENGINES FOR INPUT = 3.
RADIAL DISTANCE =  318.       RADIATION ANGLE =  72.0      AIRCRAFT VELOCITY =141.00      DURATION CORRECTION = -6.01

CHECK
   42.50   76.71   74.96   82.28   91.18   93.07   84.30   84.99   86.00   84.99   85.91   85.08
   81.74   81.41   83.44   82.62   82.00   83.76   83.88   82.33   81.17   78.04   75.03   70.32

OASPL = 98.76 DB,  SOUND LEVEL = 94.51 DBA,  PNL =109.01 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =109.01 TPNDB, EPNL =103.00 EPNDB

OCTAVE SPECTRA      84.08   95.45   89.92   90.12   87.06   87.63   87.37   80.26

1/3 OCTAVE BAND SPL'S 4200 FT. CORRECTED TO FAR DAY.

   86.40   80.61   79.86   86.19   95.09   96.98   88.22   88.91   89.93   88.92   89.85   89.04
   85.71   85.40   87.46   86.68   90.14   88.05   88.40   87.27   86.40   84.11   82.42   79.49

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. = -8.35

OASPL =102.64 DB,  SOUND LEVEL = 99.86 DBA,  PNL =113.57 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =113.57 TPNDB, EPNL =105.21 EPNDB

OCTAVE SPECTRA      87.99   99.36   95.85   94.06   91.06   91.80   92.21   87.17
```

FIGURE 4. 2-2b SMAPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.1347442R

 TEST CASE - 6/05/73 VERSION
  RADIAL DISTANCE

AVERAGE SPECTRA 4200 FT. CORRECTED TO FAR DAY.

    86.85   81.73   78.43   84.57   95.64   97.04   88.14   89.18   89.90   88.77   89.26   88.97
    96.32   85.74   87.48   86.44   86.60   8.  9   88.59   87.45   86.51   84.48   82.65   79.66

AVERAGE NORMALISED DURATION CORRECTION = -8.36 D.

AVERAGE RADIATION ANGLE =  67.75 DEG.

OASPL =103.02 DB,  SOUND LEVEL · 99.04 DBA,  PNL =113.76 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =113.76 TPNDB, EPNL =105.40 EPNDB

OCTAVE SPECTRA      89.47   95.63   93.91   93.77   91.35   92.10   92.37   87.46
```

FIGURE 4.2-2c SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134744

 TEST CASE - 6/05/73 VERSION
  RADIAL DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  100. FT..   DURATION CORRECTION = -11.37 DB

   92.88   87.76   84.46   92.61  101.69  103.09   94.20   95.25   95.98   94.86   95.37   95.11
   92.49   91.95   93.74   92.77   93.01   95.30   95.24   94.29   93.46   91.70   90.27   87.89

OASPL =109.24 DB,  SOUND LEVEL =105.53 DBA,  PNL =120.34 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =120.34 TPNDB, EPNL =108.97 EPNDB

OCTAVE SPECTRA      94.50  105.68   99.97   99.89   97.57   98.62   99.16   95.00

 WITH EGA

   89.81   84.65   81.31   85.42   98.46   99.82   90.89   91.91   92.60   91.44   91.92   91.62
   86.96   88.39   90.14   89.12   89.36   91.64   91.59   90.64   89.81   88.09   86.62   84.23

OASPL =105.85 DB,  SOUND LEVEL =101.94 DBA,  PNL =116.76 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =116.76 TPNDB, EPNL =105.39 EPNDB

OCTAVE SPECTRA      91.41  102.43   96.63   96.44   93.99   94.97   95.51   91.34

 D=  200. FT..   DURATION CORRECTION =  -8.36 DB

   86.85   81.73   78.43   86.57   9[illegible].[illegible]4   97.04   88.14   89.18   89.90   88.76   89.25   88.97
   86.32   85.[illegible]   87.48   86.43   86.60   88.78   88.58   87.45   86.51   84.40   82.64   79.66

OASPL =103.91 DB,  SOUND LEVEL   99.04 DBA,  PNL =113.76 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =113.76 TPNDB, EPNL =105.40 EPNDB

OCTAVE SPECTRA      89.47   95.63   93.90   93.77   91.34   92.18   92.37   87.46

 WITH EGA

   83.77   78.57   75.19   83.26   92.26   93.57   84.60   85.57   86.71   85.00   85.41   85.06
   82.32   81.67   83.34   82.21   82.36   84.54   84.34   83.21   82.27   80.24   78.40   75.42

OASPL = 99.34 DB,  SOUND LEVEL = 9[illegible].95 DBA,  PNL =109.67 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =109.67 TPNDB, EPNL =101.31 EPNDB

OCTAVE SPECTRA      85.35   96.20   90.28   89.93   87.27   87.94   88.13   83.22
```

FIGURE 4.2-2d SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74724.1347.4

 TEST CASE - 6/09/73 VERSION
  RADIAL DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 2.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  370. FT..    DURATION CORRECTION =  -5.69 DB

   81.49   76.37   73.06   81.19   90.26   91.65   82.73   83.76   84.46   83.29   83.75   83.43
   90.72   80.06   91.73   80.56   89.59   82.59   82.16   80.70   79.58   77.10   74.57   79.56

OASPL = 97.18 DB,  SOUND LEVEL = 92.96 DBA,  PNL =107.50 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =107.50 TPNDB, EPNL =101.81 EPNDB

OCTAVE SPECTRA      93.11   94.24   88.40   88.26   85.66   86.13   85.71   79.60

 WITH EGA

   78.27   73.01   69.55   77.56   86.48   87.72   78.67   79.56   80.12   78.81   79.13   78.67
   75.81   75.03   76.56   75.24   75.23   77.23   76.80   75.14   74.22   71.74   69.21   65.23

OASPL = 93.13 DB,  SOUND LEVEL = 87.93 DBA,  PNL =102.46 PNDB,  TONE CORRECTION = 0.0  PNDB.  PNLT =102.46 TPNDB, EPNL = 96.77 EPNDB

OCTAVE SPECTRA      79.63   90.39   84.26   83.65   80.61   80.78   80.35   74.24

 D=  800. FT..    DURATION CORRECTION =  -2.34 DB

   74.79   69.67   66.29   74.42   83.46   84.82   75.87   76.36   77.50   76.27   76.64   76.21
   73.34   72.54   73.99   72.52   72.20   73.75   72.72   70.46   68.87   65.24   60.97   54.37

OASPL = 90.15 DB,  SOUND LEVEL = 84.73 DBA,  PNL = 98.66 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 98.66 TPNDB, EPNL = 96.32 EPNDB

OCTAVE SPECTRA      76.37   87.43   81.57   81.15   78.11   77.65   75.75   66.87

 WITH EGA

   73.81   65.37   61.74   69.56   79.32   79.35   70.11   70.80   71.15   69.60   69.68   68.94
   65.78   54.67   65.82   64.03   63.63   65.18   64.15   61.89   60.30   56.67   52.39   45.80

OASPL = 84.25 DB,  SOUND LEVEL = 77.16 DBA,  PNL = 90.87 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 90.87 TPNDB, EPNL = 86.53 EPNDB

OCTAVE SPECTRA      72.30   82.12   79.48   74.19   70.23   69.10   67.18   58.30
```

FIGURE 4.2-2e   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134734

 TEST CASE - 6/04/73 VERSION
  RADIAL DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C  77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 1600. FT.,    DURATION CORRECTION =   0.67 DB

   68.66   63.50   60.15   65.24   77.25   78.56   69.55   70.46   71.01   69.64   69.86   69.23
   66.12   64.98   60.04   64.01   63.03   63.75   61.61   57.85   55.39   49.62   42.10   30.69

OASPL = 83.48 DB.   SOUND LEVEL = 76.64 DBA,   PNL = 89.38 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 89.38 TPNDB, EPNL = 90.08 EPNDB

OCTAVE SPECTRA      70.26   61.13   75.15   74.36   70.51   68.39   63.81   50.37

 WITH EGA

   62.69   56.99   53.08   60.65   69.13   69.85   60.32   60.71   60.71   58.78   58.48   57.31
   53.63   51.97   52.50   49.89   48.77   49.49   47.35   43.59   41.13   35.36   27.84   16.44

OASPL = 74.46 DB,   SOUND LEVEL = 65.97 DBA,   PNL = 78.12 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 78.12 TPNDB, EPNL = 78.80 EPNDB

OCTAVE SPECTRA      64.09   72.79   65.36   63.01   57.53   54.18   49.55   36.11

 D= 2200. FT.,    DURATION CORRECTION =   3.60 DB

   62.49   57.29   53.89   61.92   70.35   72.05   62.93   63.68   64.03   62.41   62.32   61.29
   57.65   55.89   56.15   53.03   50.72   49.77   45.41   38.64   34.45   24.39   10.38  -10.64

OASPL = 76.61 DB.   SOUND LEVEL = 68.01 DBA,   PNL = 80.10 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 80.10 TPNDB, EPNL = 83.73 EPNDB

OCTAVE SPECTRA      64.07   74.74   68.34   66.81   61.41   56.15   46.52   24.56

 WITH EGA

   55.27   49.40   45.29   52.67   60.94   61.42   51.63   51.73   51.40   49.07   48.33   46.62
   42.27   39.86   39.47   35.59   33.13   32.18   27.82   21.04   16.86    6.80   -7.21  -28.23

OASPL = 65.96 DB,   SOUND LEVEL = 54.72 DBA,   PNL = 66.72 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 66.72 TPNDB, EPNL = 70.41 EPNDB

OCTAVE SPECTRA      56.60   64.49   56.36   52.90   45.49   38.65   26.93    6.97
```

FIGURE 4.2-2f SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134744

 TEST CASE - 6/04/73 VERSION
  RADIAL DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C  77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 6400. FT..    DURATION CORRECTION =   6.69 DB

   56.17   50.89   47.39   55.30   64.08   65.07   55.70   56.15   56.11   53.96   53.27   51.43
   45.73   43.72   42.41   37.01   32.11   27.83   19.02    6.24   -1.42  -20.04  -47.04  -87.30

OASPL = 69.34 DB,  SOUND LEVEL = 56.84 DBA,  PNL = 69.98 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 69.98 TPNDB, EPNL = 76.68 EPNDB

OCTAVE SPECTRA      57.72   61.80   60.76   57.78   49.45   38.61   19.28  -20.03

 WITH EGA

   48.85   42.90   36.29   45.55   54.07   54.33   44.30   44.10   43.37   40.53   39.17   36.66
   31.26   27.59   25.62   15.49   14.42   10.14    1.33  -11.46  -19.11  -37.73  -64.74 -105.03

OASPL = 58.97 DB,  SOUND LEVEL = 46.34 DBA,  PNL = 57.03 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 57.03 TPNDB, EPNL = 63.73 EPNDB

OCTAVE SPECTRA      50.16   57.52   48.71   43.84   33.57   21.13    1.59  -37.72

 D=12800. FT..    DURATION CORRECTION =   9.70 DB

   49.54   44.11   40.41   46.07   56.55   57.12   47.26   47.11   46.27   43.09   41.17   37.73
   33.42   25.41   23.93   11.04    0.92  -10.02  -27.72  -52.54  -67.13 -102.87 -155.86 -234.55

OASPL = 61.29 DB,  SOUND LEVEL = 48.03 DBA,  PNL = 59.05 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 59.05 TPNDB, EPNL = 66.75 EPNDB

OCTAVE SPECTRA      51.01   60.11   51.67   45.95   32.32   11.47  -27.71 -102.67

 WITH EGA

   42.23   36.12   31.71   36.72   46.54   46.38   35.87   35.06   33.54   29.66   27.08   22.56
   15.45    9.27    4.14   -7.48  -16.77  -27.72  -45.42  -70.23  -84.82 -120.57 -173.55 -252.29

OASPL = 51.12 DB,  SOUND LEVEL = 37.26 DBA,  PNL = 46.54 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 46.54 TPNDB, EPNL = 56.24 EPNDB

OCTAVE SPECTRA      43.48   45.82   39.70   32.13   16.64   -6.06  -45.41 -120.57
```

FIGURE 4.2-2g   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.13474518

 TEST CASE - 06/05/73 VERSION
 CERTIFICATION  DATA    TAKEOFF      SIDELINE DISTANCE

SPECTRUM # 1

TEMPERATURE =  77.00      RELATIVE HUMIDITY = 70.00       PRESSURE =  29.9      NO. OF ENGINES FOR INPUT = 3.
FLYOVER DISTANCE =  200.      RADIATION ANGLE =  88.2      AIRCRAFT VELOCITY =160.00      DURATION CORRECTION =-10.05

CHECK
   93.29   86.43   89.90   91.80  100.85  101.47   96.89   99.84  101.09   99.37   97.72   97.45
   96.23   95.90   96.78   94.73   97.65   96.50   95.84   94.99   91.36   88.69   85.12   80.19

OASPL =110.77 DB,  SOUND LEVEL =107.59 DBA,  PNL =121.47 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =121.47 TPNDB, EPNL =111.42 EPNDB

OCTAVE SPECTRA      95.32  105.06  104.37  103.04  101.09  101.47   99.22   90.62

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. =-10.65
```

FIGURE 4.2-2h SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE 074224.134345

 TEST CASE - 06/15/77 VERSION
 CERTIFICATION DATA    TAKEOFF      SIDELINE DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =      0.0 FT
TEMPERATURE = ISA PLUS 10.00 DEG. C  77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  100. FT..   DURATION CORRECTION = -13.06 DB

   99.32   92.96   94.91  103.04  106.89  107.52  102.94  105.90  107.16  105.46  103.83  103.58
  102.39  102.10  103.02  102.04  104.03  102.98  102.45  101.77   98.24   95.73   92.63   88.25

OASPL =116.96 DB,  SOUND LEVEL =113.95 DBA,  PNL =127.93 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =127.93 TPNDB, EPNL =114.87 EPNDB

OCTAVE SPECTRA     101.35  111.12  110.44  109.14  107.29  107.86  105.94   97.95

 WITH EGA

   92.24   89.85   91.70  100.65  103.67  104.26   99.66  102.58  103.81  102.07  100.40  100.12
   98.95   98.56   99.46   98.43  100.42   99.37   98.84   98.16   94.63   92.12   89.01   84.64

OASPL =113.46 DB,  SOUND LEVEL =110.41 DBA,  PNL =124.41 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =124.41 TPNDB, EPNL =111.35 EPNDB

OCTAVE SPECTRA     98.25  107.90  107.11  105.72  103.76  104.25  102.33   94.34

 D=  200. FT..   DURATION CORRECTION = -10.05 DB

   93.29   96.93   89.92   97.60  100.25  101.47   96.89   99.04  101.09   99.37   97.72   97.45
   96.23   95.90   96.78   95.73   97.65   96.50   95.64   94.99   91.36   88.60   85.12   80.19

OASPL =110.77 DB,  SOUND LEVEL =107.59 DBA,  PNL =121.47 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =121.47 TPNDB, EPNL =111.42 EPNDB

OCTAVE SPECTRA     95.32  105.00  104.37  103.04  101.09  101.47   99.22   90.62

 WITH EGA

   90.21   83.78   85.68   94.51   97.49   96.03   93.39   96.27   97.45   95.66   93.94   93.60
   92.31   91.91   92.72   91.59   93.50   92.35   91.69   90.34   87.21   84.45   80.97   76.

OASPL =107.30 DB,  SOUND LEVEL =103.60 DBA,  PNL =117.49 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =117.49 TPNDB, EPNL =107.44 EPNDB

OCTAVE SPECTRA     92.19  101.70  100.78   99.27   97.10   97.32   95.07   86.47
```

FIGURE 4.2-21 SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

 TEST CASE - 06/05/73 VERSION
 CERTIFICATION DATA    TAKEOFF      SIDELINE DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  370. FT..    DURATION CORRECTION =  -7.38 DB

   87.93   81.57   84.53   92.42   95.47   96.08   91.49   94.42   95.65   93.91   92.23   91.92
   90.64   90.25   91.05   85.89   91.69   90.37   89.49   98.35   84.55   81.37   77.25   71.37

OASPL =105.19 DB,  SOUND LEVEL =101.71 DBA,  PNL =115.35 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =115.35 TPNDB, EPNL =107.98 EPNDB

OCTAVE SPECTRA      89.56   95.69   98.95   97.54   95.43   95.49   92.69   83.09

 WITH EGA

   84.74   78.25   80.08   89.95   91.76   92.24   87.52   90.33   91.43   89.55   87.74   67.30
   85.90   85.38   86.06   84.76   86.51   85.20   84.32   83.18   79.38   76.19   72.06   66.20

OASPL =100.90 DB,  SOUND LEVEL = 96.96 DBA,  PNL =110.50 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =110.59 TPNDB, EPNL =103.13 EPNDB

OCTAVE SPECTRA      86.69   95.56   94.82   93.08   90.56   90.33   87.52   77.92

 D=  800. FT..    DURATION CORRECTION =  -4.03 DB

   81.19   74.82   76.77   85.65   88.68   89.26   84.64   87.53   88.72   86.91   85.15   84.74
   83.34   82.79   83.39   81.56   83.42   81.69   80.26   78.37   74.14   69.89   64.15   55.86

OASPL = 97.95 DB,  SOUND LEVEL = 93.61 DBA,  PNL =106.94 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =106.94 TPNDB, EPNL =102.91 EPNDB

OCTAVE SPECTRA      83.21   92.53   92.05   90.47   87.95   87.20   83.03   71.05

 WITH EGA

   77.37   70.72   72.38   86.59   83.74   84.02   79.13   81.75   82.65   80.55   78.53   77.83
   76.14   75.32   75.66   73.92   75.31   73.58   72.15   70.25   66.02   61.78   56.04   47.77

OASPL = 92.00 DB,  SOUND LEVEL = 86.58 DBA,  PNL = 99.63 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 99.63 TPNDB, EPNL = 95.60 EPNDB

OCTAVE SPECTRA      79.22   87.80   86.19   83.90   80.49   79.11   74.91   62.94
```

FIGURE 4.2-2j   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

 TEST CASE - 06/05/71 VERSION
 CERTIFICATION DATA    TAKEOFF     SIDELINE DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGI     FOR OUTPUT = 2.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 1600. FT..    DURATION CORRECTION =  -1.02 DB

   79.10   68.71   70.64   79.40   82.48   83.02   78.34   81.16   82.25   80.32   78.43   77.83
   76.18   75.35   75.59   71.63   74.49   71.99   69.53   66.24   61.21   54.58   46.23   33.51

OASPL = 91.19 DB,  SOUND LEVEL = 86.01 DBA,  PNL = 98.28 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 98.26 TPNDB, EPNL = 97.26 EPNDB

OCTAVE SPECTRA      77.11   84.69   85.65   83.77   80.49   78.26   71.61   55.55

 WITH EGA

   64.36   67.44   63.83   72.18   74.66   74.64   69.46   71.78   72.35   69.88   67.48   66.36
   64.18   62.64   62.57   60.65   60.78   58.28   55.82   52.53   47.50   41.27   32.53   19.60

OASPL = 81.99 DB,  SOUND LEVEL = 74.52 DBA,  PNL = 86.82 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 86.82 TPNDB, EPNL = 85.80 EPNDB

OCTAVE SPECTRA      71.07   76.75   76.14   72.93   68.02   64.69   57.90   41.84

 D= 3200. FT..    DURATION CORRECTION =   1.99 DB

   68.96   62.52   64.40   73.19   76.11   76.55   71.76   74.44   75.35   73.18   71.00   70.03
   67.90   66.48   65.99   62.99   62.64   58.60   54.08   48.01   41.37   31.17   16.42   -5.22

OASPL = 84.14 DB,  SOUND LEVEL = 77.47 DBA,  PNL = 88.92 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 88.92 TPNDB, EPNL = 90.91 EPNDB

OCTAVE SPECTRA      70.53   80.29   78.87   76.38   71.64   66.58   55.22   31.32

 WITH EGA

   61.78   54.68   55.85   63.59   66.26   65.97   60.52   62.55   62.78   59.90   57.06   55.42
   52.58   50.51   49.36   45.63   45.11   41.06   36.54   30.47   23.83   13.64   -1.12  -22.75

OASPL = 73.01 DB,  SOUND LEVEL = 63.72 DBA,  PNL = 75.14 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 75.14 TPNDB, EPNL = 77.13 EPNDB

OCTAVE SPECTRA      63.40   70.29   66.83   62.64   55.80   49.13   37.69   13.76
```


FIGURE 4.2-2k   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE 074724.134744

 TEST CASE - 06/05/73 VERSION
 CERTIFICATION DATA    TAKEOFF      SIDELINE DISTANCE

REFERENCE CONDITIONS
PRESSURE ALTITUDE =    0.0 FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES PER OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 R= 1400. FT..    DURATION CORRECTION =    5.00 DB

   62.65    56.14    57.53    66.61    69.39    69.63    64.62    67.02    67.57    64.91    62.16    60.46
   57.34    54.77    52.81    41.71    44.97    37.84    29.20    17.56     7.71   -10.41   -37.20   -76.64

OASPL = 76.63 DB,  SOUND LEVEL = 68.16 DBA,  PNL = 78.82 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 78.82 TPNDB, EPNL = 83.82 EPNDB

OCTAVE SPECTRA      64.58    73.52    71.35    67.68    60.14    49.86    29.52   -10.43

 WITH FCA

   55.33    48.15    49.23    57.26    59.38    58.40    53.22    54.97    54.83    51.48    48.07    45.68
   41.67    38.63    36.32    30.21    27.27    20.14    11.50    -0.13    -9.98   -28.11   -54.89   -94.34

OASPL = 65.76 DB,  SOUND LEVEL = 55.09 DBA,  PNL = 65.32 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 65.32 TPNDB, EPNL = 70.33 EPNDB

OCTAVE SPECTRA      56.91    62.37    59.18    53.83    44.26    32.27    11.82   -28.10

 R=12500. FT..    DURATION CORRECTION =    8.01 DB

   58.07    49.42    51.02    55.40    61.98    61.83    56.36    56.21    58.01    54.40    50.52    47.33
   42.26    37.36    32.48    22.24    15.64     2.34   -14.54   -37.31   -53.58   -87.56  -138.41  -213.48

OASPL = 68.32 DB,  SOUND LEVEL = 57.74 DBA,  PNL = 67.43 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 67.43 TPNDB, EPNL = 75.44 EPNDB

OCTAVE SPECTRA      57.91    66.01    62.37    56.46    43.81    23.96   -14.51   -87.56

 WITH FCA

   48.75    41.43    42.32    50.12    51.97    51.09    44.97    46.15    45.28    40.97    36.42    32.55
   26.78    21.23    15.69     5.72    -2.06   -15.36   -32.23   -55.01   -71.28  -105.26  -156.10  -231.18

OASPL = 57.93 DB,  SOUND LEVEL = 45.48 DBA,  PNL = 54.37 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 54.37 TPNDB, EPNL = 62.39 EPNDB

OCTAVE SPECTRA      50.25    55.90    50.27    42.71    28.11     6.42   -32.21  -105.26
```

FIGURE 4.2-21   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASF =74224.13474569

                    L-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA     PART POWER     (N1/SQRT(THETA)=55%)

     FAIRED SPECTRA

TEMPERATURE =  77.00      RELATIVE HUMIDITY = 70.00      PRESSURE =  29.9      NO. OF ENGINES FOR INPUT = 3.
FLYOVER DISTANCE =  200.      RADIATION ANGLE =  65.5      AIRCRAFT VELOCITY =160.00      DURATION CORRECTION = -8.37

CHECK
   94.44   79.32   76.00   86.65   86.81   88.56   84.63   95.39   87.80   87.77   86.27   87.39
   96.19   86.00   85.50   83.89   84.53   85.15   83.72   92.76   81.06   78.66   77.98   72.49

MASPL = 95.37 DB,  SOUND LEVEL = 97.24 DBA,  PNL =109.97 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =109.97 TPNDB, EPNL =101.60 EPNDB

OCTAVE SPECTRA     86.66   92.74   90.93   92.60   90.68   89.12   87.42   81.88

DURATION CORRECTION NORMALISED TO 200' AND 160 KEAS. = -8.37
```

FIGURE 4.2-2m   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

                         L-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA      FART POWER      (N1/SQRT(THETA)=55%)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =    0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 AT  100. FT.,    DURATION CORRECTION = -11.38 DB

   92.47   85.35   87.01   92.09   94.85   94.61   90.69   91.46   93.88   93.87   94.39   93.53
   92.36   92.21   91.76   90.23   90.95   91.67   90.39   89.62   88.03   85.90   85.63   80.75

OASPL =105.29 DB,   SOUND LEVEL =102.63 DBA,   PNL =116.51 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =116.51 TPNDB, EPNL =105.13 EPNDB

OCTAVE SPECTRA       92.39   98.79   97.00   98.71   96.89   95.76   94.22   89.41

WITH ECA

   87.40   82.24   79.64   88.90   91.62   91.34   87.38   88.11   90.50   90.44   90.92   90.03
   89.63   88.64   89.15   86.57   87.28   88.01   86.72   85.95   84.36   82.23   81.97   77.09

OASPL =101.86 DB,   SOUND LEVEL = 99.05 DBA,   PNL =112.91 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =112.91 TPNDB, EPNL =101.53 EPNDB

OCTAVE SPECTRA       88.99   95.55   93.65   95.25   93.32   92.10   90.56   85.75

 AT  200. FT.,    DURATION CORRECTION =  -8.37 DB

   84.44   79.32   76.00   86.05   88.81   88.56   84.63   85.39   87.80   87.77   88.27   87.39
   86.19   86.00   85.50   83.84   84.53   85.15   83.72   82.76   81.06   78.66   77.98   72.49

OASPL = 99.07 DB,   SOUND LEVEL = 96.24 DBA,   PNL =109.96 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =109.96 TPNDB, EPNL =101.60 EPNDB

OCTAVE SPECTRA       86.05   92.74   90.93   92.59   90.68   89.32   87.42   81.87

WITH ECA

   81.35   76.16   72.75   82.73   85.42   85.08   81.08   81.77   84.10   83.99   84.41   83.46
   82.18   81.91   81.34   79.65   80.27   80.89   79.46   78.50   76.80   74.40   73.72   68.23

OASPL = 95.29 DB,   SOUND LEVEL = 92.15 DBA,   PNL =105.87 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =105.87 TPNDB, EPNL = 97.59 EPNDB

OCTAVE SPECTRA       82.54   89.34   87.29   88.74   86.59   85.07   83.15   77.61
```

FIGURE 4.2-2n   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

                    L-1011-1 / RB211-22B / -22C
    CERTIFICATION DATA     PART POWER     (N1/SQRT(THETA)=55%)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =      0.0 FT
TEMPERATURE = ISA PLUS 10.00 DEG. C  77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 2.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  370. FT.,    DURATION CORRECTION =  -5.70 DB

   75.38   73.95   70.63   80.67   83.42   83.16   79.22   79.96   82.35   82.29   82.76   81.84
   80.58   80.32   79.74   78.01   78.50   78.94   77.27   75.99   74.10   71.24   69.80   63.33

OASPL = 93.42 DB,  SOUND LEVEL = 90.31 DBA,  PNL =103.83 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT =103.80 TPNDB, EPNL = 98.11 EPNDB

OCTAVE SPECTRA      80.69   87.35   86.50   87.08   85.00   83.27   80.75   74.00

 WITH ECA

   75.85   70.59   67.11   71.02   74.63   79.22   75.14   75.74   77.99   77.76   78.11   77.05
   75.64   75.25   74.52   72.24   73.10   73.54   71.87   70.58   66.70   65.83   64.45   57.92

OASPL = 88.98 DB,  SOUND LEVEL = 85.27 DBA,  PNL = 98.73 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 98.73 TPNDB, EPNL = 93.03 EPNDB

OCTAVE SPECTRA      77.41   83.54   81.24   82.44   79.93   77.88   75.34   68.60

 D=  600. FT.,    DURATION CORRECTION =  -2.35 DB

   72.34   67.20   63.86   73.89   76.62   76.13   72.36   73.06   75.39   75.26   75.65   74.61
   73.21   72.78   71.98   65.94   70.09   70.07   67.79   65.68   63.32   59.29   56.13   46.57

OASPL = 86.11 DB,  SOUND LEVEL = 82.36 DBA,  PNL = 95.16 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 95.16 TPNDB, EPNL = 92.81 EPNDB

OCTAVE SPECTRA      71.55   80.55   78.58   79.97   77.46   74.80   70.74   61.17

 WITH ECA

   68.37   62.93   59.27   69.00   71.43   70.81   66.54   66.94   66.97   68.52   68.60   67.26
   65.44   64.81   63.71   61.35   61.41   61.39   59.11   57.00   54.64   50.61   47.45   38.29

OASPL = 79.90 DB,  SOUND LEVEL = 74.66 DBA,  PNL = 87.21 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 87.21 TPNDB, EPNL = 84.86 EPNDB

OCTAVE SPECTRA      65.86   75.30   72.39   72.94   69.52   66.15   62.06   52.49
```

FIGURE 4.2-20   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

                L-1011-1 / RB211-22B / -22C
    CERTIFICATION DATA     PART POWER     (N1/SQRT(THETA)-55%)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS 10.00 DEG. (  77.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 1000. FT.,    DURATION CORRECTION =   0.66 DB

   65.24   61.07   57.72   67.72   70.41   70.07   66.03   66.65   68.89   68.63   68.85   67.62
   65.95   55.20   64.00   61.39   60.86   60.00   56.59   52.95   49.71   43.50   37.04   22.58

OASPL = 79.26 DB,  SOUND LEVEL = 74.52 DBA,  PNL = 85.90 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 85.90 TPNDB, EPNL = 86.57 EPNDB

OCTAVE SPECTRA      67.84   74.32   72.14   73.17   69.89   65.56   58.73   44.42

 WITH EGA

   60.23   54.52   53.55   60.06   62.22   61.29   56.72   56.02   58.51   57.66   57.38   55.59
   53.36   52.38   50.35   47.15   46.49   45.62   42.21   38.53   35.33   29.12   22.60    8.60

OASPL = 69.58 DB,  SOUND LEVEL = 62.40 DBA,  PNL = 73.67 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 73.67 TPNDB, EPNL = 74.34 EPNDB

OCTAVE SPECTRA      61.62   66.04   64.20   61.75   56.87   51.23   44.35   30.04

 D= 2200. FT.,    DURATION CORRECTION =   3.67 DB

   60.07   54.87   51.46   61.39   64.01   63.56   59.39   59.86   61.90   61.37   61.29   59.64
   57.44   56.05   54.04   50.29   48.44   45.88   40.21   33.52   28.51   17.94    4.87  -18.97

OASPL = 72.07 DB,  SOUND LEVEL = 65.87 DBA,  PNL = 76.19 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 76.19 TPNDB, EPNL = 79.86 EPNDB

OCTAVE SPECTRA      61.65   67.50   65.30   65.61   60.83   53.34   41.29   18.15

 WITH EGA

   52.84   46.97   42.85   52.12   54.08   52.91   48.09   47.90   49.25   48.03   47.29   44.56
   42.05   40.01   37.35   32.87   30.84   28.28   22.61   15.91   10.91    0.34  -12.73  -34.57

OASPL = 61.04 DB,  SOUND LEVEL = 51.81 DBA,  PNL = 62.13 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 62.13 TPNDB, EPNL = 65.80 EPNDB

OCTAVE SPECTRA      54.17   57.88   53.23   51.71   44.98   35.82   23.69    0.55
```

FIGURE 4.2-2p SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

                    I-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA     FAST POWER     (N1/SQRT(THETA)=554)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0 FT
TEMPERATURE = ISA PLUS 10.00 DEG. C   77.00 DEG. F
RELATIVE HUMIDITY = 70.CC PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 4000. FT..   DURATION CORRECTION =   6.68 DB

  53.74   48.47   44.95   54.76   57.22   56.55   52.15   52.31   53.94   52.88   52.18   49.72
  46.44   43.78   40.36   34.17   29.62   21.67   13.47    0.66   -7.88  -27.16  -53.44  -96.86

OASPL = 64.37 DB,  SOUND LEVEL = 56.13 DBA,  PNL = 65.65 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 65.65 TPNDB, EPNL = 72.34 EPNDB

OCTAVE SPECTRA     55.29   61.07   57.65   56.56   48.94   35.72   13.72  -27.15

 WITH EGA

  46.43   40.47   36.25   45.40   47.21   45.81   40.75   40.26   41.21   39.45   38.08   34.94
  30.96   27.65   21.37   16.61   11.92    5.97   -4.22  -17.04  -25.57  -44.85  -71.14 -114.55

OASPL = 53.42 DB,  SOUND LEVEL = 42.78 DBA,  PNL = 51.95 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 51.95 TPNDB, EPNL = 58.63 EPNDB

OCTAVE SPECTRA     47.73   50.50   45.53   42.64   33.11   18.15   -3.97  -44.84

 D=12500. FT..   DURATION CORRECTION =   9.69 DB

  47.11   41.68   37.94   47.51   49.67   48.57   43.67   43.21   44.04   41.93   39.97   35.88
  30.46   25.25   19.41    7.01   -2.01  -14.74  -33.99  -59.04  -74.63 -111.33 -164.05 -246.61

OASPL = 55.55 DB,  SOUND LEVEL = 44.87 DBA,  PNL = 53.52 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 53.52 TPNDB, EPNL = 63.21 EPNDB

OCTAVE SPECTRA     48.59   53.44   48.42   44.68   31.80    8.26  -33.97 -111.33

 WITH EGA

  35.80   33.68   27.25   36.15   39.66   37.83   32.27   31.16   31.31   28.49   25.88   21.11
  [illegible]    9.12    1.62   -6.71  -19.71  -32.44  -51.68  -76.73  -92.32 -129.03 -181.75 -264.31

OASPL = 46.34 DB,  SOUND LEVEL = 32.50 DBA,  PNL = 40.40 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 40.40 TPNDB, EPNL = 50.09 EPNDB

OCTAVE SPECTRA     41.04   43.39   36.38   30.88   16.14   -9.27  -51.67 -129.03
```

FIGURE 4.2-2q SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE #74224.134745

                    L-1011-1 / RB211-22B / -22C
    CERTIFICATION DATA      PART POWER      (N1/SQRT(THETA)=55%)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS-21.67 DEG. C  20.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 2.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  100. FT.,   DURATION CORRECTION = -11.38 DB

   90.72   85.60   82.28   92.34   95.11   94.86   90.94   91.71   94.13   94.11   94.62   93.75
   92.55   92.35   91.83   90.16   90.76   91.28   89.67   88.56   86.82   84.37   83.80   76.72

OASPL =105.34 DB,   SOUND LEVEL =102.47 DBA,   PNL =116.17 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =116.17 TPNDB, EPNL =104.80 EPNDB

OCTAVE SPECTRA      92.33   95.04   97.26   98.95   97.03   95.53   93.28   87.69

 WITH FGA

   87.54   92.41   75.13   85.15   91.80   91.59   87.64   88.37   90.75   90.69   91.16   90.25
   89.31   88.76   88.22   86.52   87.09   87.61   86.01   84.90   83.15   80.71   80.13   75.06

OASPL =101.92 DB,   SOUND LEVEL = 96.66 DBA,   PNL =112.58 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =112.58 TPNDB, EPNL =101.23 EPNDB

OCTAVE SPECTRA      89.24   95.81   93.90   95.49   93.45   91.87   89.61   84.03

 D=  200. FT.,   DURATION CORRECTION =  -8.37 DB

   84.65   79.57   76.26   86.31   89.07   86.83   84.93   85.66   88.06   88.02   88.50   87.50
   88.31   86.03   85.39   83.55   83.90   84.11   82.05   80.40   78.40   75.36   74.06   68.18

OASPL = 99.01 DB,   SOUND LEVEL = 95.76 DBA,   PNL =109.10 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =109.10 TPNDB, EPNL =100.73 EPNDB

OCTAVE SPECTRA      86.31   93.01   91.20   92.82   90.70   88.63   85.30   78.22

 WITH FGA

   81.51   76.41   73.01   82.55   85.68   85.35   81.35   82.03   84.36   84.24   84.64   83.45
   82.30   81.94   81.23   79.31   79.63   79.85   77.79   76.14   74.13   71.09   69.80   63.92

OASPL = 95.27 DB,   SOUND LEVEL = 91.70 DBA,   PNL =105.01 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =105.01 TPNDB, EPNL = 96.65 EPNDB

OCTAVE SPECTRA      83.19   85.60   87.55   88.97   86.62   84.37   81.04   73.96
```

FIGURE 4.2-2r SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE 974224.134745

                         L-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA      PART POWER      (N1/SQRT(THETA)=55%)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =      0.0  FT
TEMPERATURE = ISA PLUS-21.67 DEG. C   20.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 2.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D=  370. FT..    DURATION CORRECTION =  -5.70 DB

   79.34   74.22   70.90   80.95   83.71   83.45   79.51   80.25   82.63   82.55   82.98   81.98
   80.30   80.17   79.33   77.17   77.13   76.81   73.98   71.43   68.97   64.92   62.41   55.16

OASPL = 93.28 DB,   SOUND LEVEL = 89.50 DBA,   PNL =102.14 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT =102.14 TPNDB, EPNL = 96.44 EPNDB

OCTAVE SPECTRA      80.95   87.64   85.78   87.29   84.84   81.81   76.70   67.14

 WITH EGA

   76.11   70.85   67.38   77.29   79.91   79.51   75.43   76.03   78.27   78.04   78.33   77.19
   75.66   75.10   74.11   71.80   71.72   71.41   68.58   66.02   63.56   59.52   57.00   49.75

OASPL = 88.92 DB,   SOUND LEVEL = 84.55 DBA,   PNL = 97.10 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 97.10 TPNDB, EPNL = 91.40 EPNDB

OCTAVE SPECTRA      77.67   83.82   81.53   82.65   79.77   76.42   71.30   61.74

 D=  800. FT..    DURATION CORRECTION =  -2.35 DB

   72.62   67.49   64.16   74.20   76.95   76.67   72.70   73.40   75.72   75.54   75.83   74.65
   72.98   72.18   70.81   67.86   66.83   65.18   60.39   55.53   51.94   45.36   39.74   29.02

OASPL = 85.96 DB,   SOUND LEVEL = 81.22 DBA,   PNL = 92.13 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 92.13 TPNDB, EPNL = 89.78 EPNDB

OCTAVE SPECTRA      74.23   80.87   78.91   80.14   76.85   71.53   62.06   46.49

 WITH EGA

   68.65   6  22   59.57   65.31   71.76   71.15   66.88   67.28   69.29   68.79   68.76   67.29
   65.31   6   70   62.54   59.26   58.15   56.50   51.71   46.85   43.26   36.68   31.06   20.34

OASPL = 79.83 DB,   SOUND LEVEL = 73.79 DBA,   PNL = 84.79 PNDB,   TONE CORRECTION = 0.0  PNDB,   PNLT = 84.79 TPNDB, EPNL = 82.44 EPNDB

OCTAVE SPECTRA      70.14   75.63   72.72   73.11   68.93   62.88   53.38   37.81
```

FIGURE 4.2-2s   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE •7422-.134745

                    L-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA     PART POWER     (N1/SQRT(THETA)=558)

REFERENCE CONDITIONS
PRESSURE ALTITUDE =     0.0  FT
TEMPERATURE = ISA PLUS-21.67 DEG. F  20.00 DEG. F
RELATIVE HUMIDITY = 70.00 PERCENT
NO. OF ENGINES FOR OUTPUT = 3.

1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 R= 1000. FT..   DURATION CORRECTION =   0.66 DB

   58.56   61.92   59.09   58.10   70.02   70.50   66.48   67.10   69.30   68.93   68.97   67.44
   65.24   63.74   61.41   58.97   54.11   49.98   41.54   32.41   26.71   15.39    4.02  -13.16

OASPL = 79.22 DB,  SOUND LEVEL = 71.34 DBA,  PNL = 83.30 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 83.33 TPNDB, EPNL = 83.96 EPNDB

OCTAVE SPECTRA     68.17   74.73   72.57   73.27   68.51   59.32   42.17   15.70

 WITH FGA

   60.54   54.86   50.55   60.44   52.63   61.73   57.17   57.27   58.91   57.98   57.50   55.41
   52.65   50.62   47.76   42.73   39.73   35.60   27.16   18.03   12.33    1.01  -10.36  -27.54

OASPL = 69.89 DB,  SOUND LEVEL = 61.75 DBA,  PNL = 71.85 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 71.85 TPNDB, EPNL = 72.52 EPNDB

OCTAVE SPECTRA     61.94   66.46   62.63   61.87   55.55   45.02   27.79    1.32

 R= 2200. FT..   DURATION CORRECTION =   3.67 DB

   60.45   55.20   51.52   61.91   64.58   64.18   63.05   60.51   62.47   61.73   61.28   59.04
   55.77   52.89   48.62   41.71   34.69   25.59    9.86   -7.82  -17.74  -38.53  -61.42  -91.50

OASPL = 72.26 DB,  SOUND LEVEL = 64.92 DBA,  PNL = 74.19 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 74.19 TPNDB, EPNL = 77.87 EPNDB

OCTAVE SPECTRA     62.05   66.47   65.91   65.61   58.10   42.18    9.94    3.51

 WITH FGA

   53.23   47.39   43.31   52.64   54.55   53.53   48.74   48.55   49.83   48.39   47.28   44.36
   40.39   36.85   31.92   22.78   17.08    7.99   -7.74  -25.42  -35.35  -56.13  -79.02 -109.11

OASPL = 61.45 DB,  SOUND LEVEL = 51.46 DBA,  PNL = 60.66 PNDB,  TONE CORRECTION = 0.0  PNDB,  PNLT = 60.66 TPNDB, EPNL = 64.33 EPNDB

OCTAVE SPECTRA     54.57   56.46   53.45   51.75   42.39   24.72   -7.66  -56.11
```

FIGURE 4.2-2t   SAMPLE PROGRAM OUTPUT - TABULAR DATA

```
CASE 474224.134745

                         L-1011-1 / RB211-22B / -22C
     CERTIFICATION DATA      PART POWER      (N1/SQRT(THETA)=55%)

 REFERENCE CONDITIONS
 PRESSURE ALTITUDE =      0.0  FT
 TEMPERATURE = ISA PLUS-21.67 DEG. C  20.00 DEG. F
 RELATIVE HUMIDITY = 70.00 PERCENT
 NO. OF ENGINES FOR OUTPUT = 3.

 1/3 OCTAVE BAND SPL'S CORRECTED TO REFERENCE DAY

 D= 6400. FT..    DURATION CORRECTION =    6.68 DB

   54.27   49.07   45.44   55.55   58.12   57.55   53.21   53.36   54.84   53.36   51.92   48.26
   42.86   37.21   29.07   15.71    1.87  -17.15  -47.47  -32.25 -100.63 -140.34 -186.26 -242.17

 OASPL = 64.99 DB,   SOUND LEVEL = 55.73 DBA,   PNL = 64.55 PNDB,   TONE CORRECTION = 1.25 PNDB,   PNLT = 65.80 TPNDB, EPNL = 72.49 EPNDB

 OCTAVE SPECTRA     55.65   61.58   58.64   56.43   44.05   15.89  -47.47 -140.34

  WITH FCA

   46.45   41.07   36.54   46.20   48.10   46.82   41.81   41.31   42.10   39.93   37.03   33.49
   27.39   21.07   12.73   -1.51  -15.83  -34.85  -65.16  -79.94 -118.32 -158.04 -203.56 -259.66

 OASPL = 54.55 DB,   SOUND LEVEL = 42.98 DBA,   PNL = 51.30 PNDB,   TONE CORRECTION = 1.25 PNDB,   PNLT = 52.55 TPNDB, EPNL = 59.23 EPNDB

 OCTAVE SPECTRA     48.28   51.89   46.53   42.58   28.41   -1.64  -65.16 -158.04

  D=12800. FT..    DURATION CORRECTION =    9.69 DB

   47.91   42.63   35.09   46.86   51.21   50.33   45.55   45.08   45.59   42.64   39.22   32.73
   23.07   11.86   -4.01  -29.26  -57.76  -96.63 -156.11 -225.10 -260.37 -337.94 -429.53 -537.47

 OASPL = 57.31 DB,   SOUND LEVEL = 45.62 DBA,   PNL = 53.93 PNDB,   TONE CORRECTION = 2.29 PNDB,   PNLT = 56.22 TPNDB, EPNL = 65.91 EPNDB

 OCTAVE SPECTRA     49.46   55.01   50.18   44.56   23.39  -29.26 -156.11 -337.94

  WITH FCA

   40.60   34.63   30.39   35.51   41.20   39.59   34.15   33.03   32.86   29.21   25.12   17.96
    7.59   -4.27  -20.80  -46.78  -75.45 -114.33 -173.81 -242.79 -278.07 -355.64 -447.62 -555.17

 OASPL = 47.36 DB,   SOUND LEVEL = 33.61 DBA,   PNL = 41.04 PNDB,   TONE CORRECTION = 2.29 PNDB,   PNLT = 43.32 TPNDB, EPNL = 53.02 EPNDB

 OCTAVE SPECTRA     41.90   44.94   38.16   30.87    7.87  -46.77 -173.61 -355.64
```

FIGURE 4.2-2u SAMPLE PROGRAM OUTPUT - TABULAR DATA

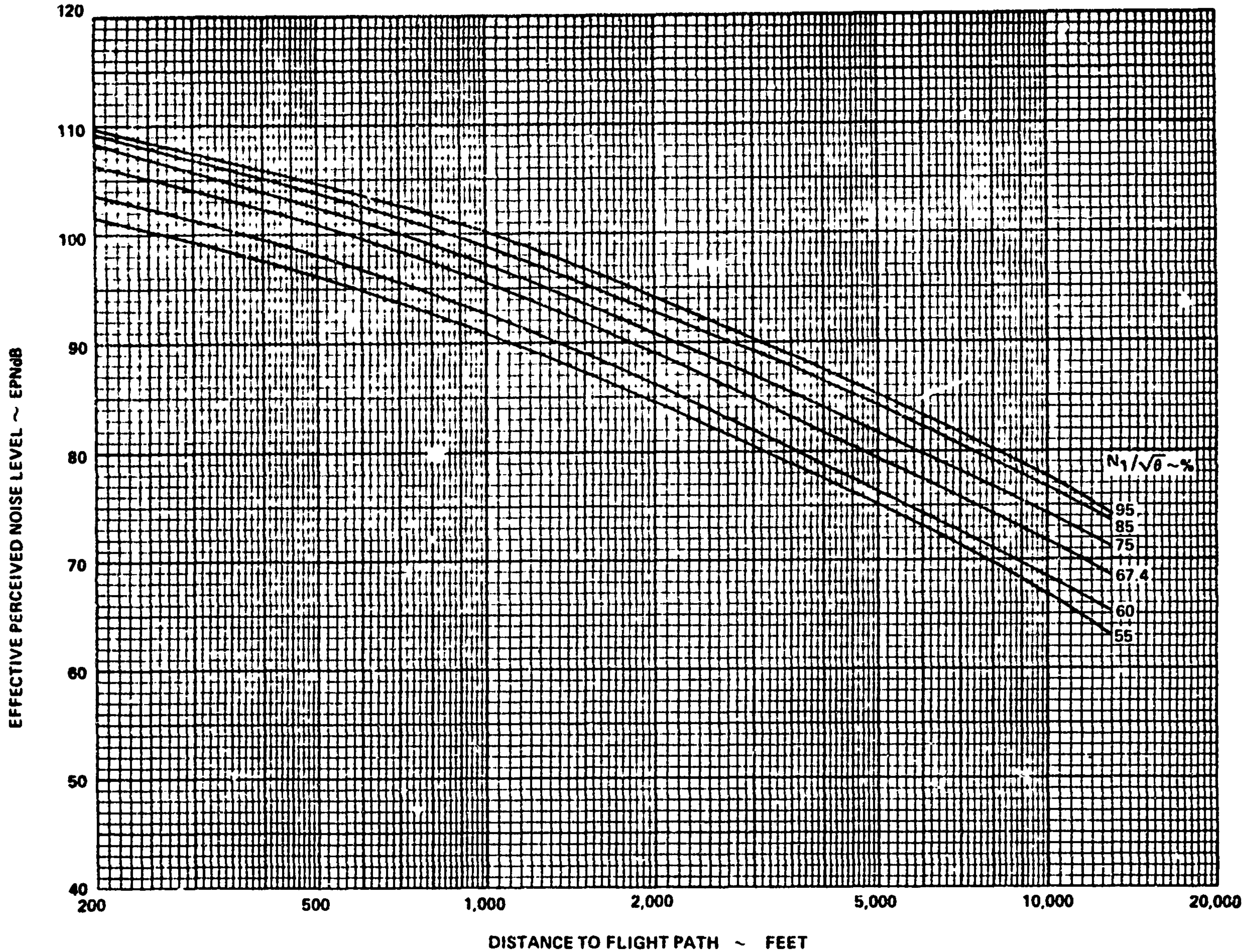


FIGURE 4.2-3 L-1011-1/RB 211-22B NOISE PROPAGATION
EFFECTIVE PERCEIVED NOISE LEVEL AT 160 KTS
SEA LEVEL 77°F 70% RELATIVE HUMIDITY

4.2.2 Climb Noise

The first sample case for the Noise Definition Program is a normal takeoff at the certification conditions. Figure 4.2-4 shows the input listing for this, as well as for the approach which is treated in the following Section 4.2.3. The tabulated takeoff output data are included on Figure 4.2-5a through 1. Computer plotted output showing centerline noise and maximum noise contours are illustrated by Figure 4.2-6a and b.

```
L-1011-1 / RB211-22B  EFFECTIVE PERCEIVED NOISE LEVEL                             CARD1A01
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY                                        CARD1B01
EFFECTIVE PERCEIVED NOISE LEVEL           EPNDB                                     CARD1C01
    5    10         1                                                               CARD1D01
55.       60.       65.       67.4      70.       75.       80.                     CARD1E01
85.       90.       95.                                                             CARD1E02
97.5      93.03     84.16     74.34     65.6      58.63     50.05                   CARD1F01
99.52     94.96     86.75     75.85     67.34     60.41     52.56                   CARD1F02
101.44    96.67     88.51     78.03     69.57     62.73     55.02                   CARD1F03
102.26    97.69     [illegible] 78.     70.58     63.77     56.12                   CARD1F04
103.09    98.52     90.19     [illegible] 71.62   64.65     57.23                   CARD1F05
103.96    97.42     91.17     81.23     72.93     66.22     58.65                   CARD1F06
104.67    100.33    92.58     82.91     74.37     67.14     60.33                   CARD1F07
105.11    100.81    93.22     83.66     75.23     68.51     61.17                   CARD1F08
105.42    101.3     94.07     84.66     76.26     69.6      61.79                   CARD1F09
105.65    101.52    94.26     84.31     75.87     69.16     61.3                    CARD1F10
101.6     98.11     92.81     82.57     79.66     72.44     63.21                   CARD1G01
103.63    100.04    94.7      86.38     81.2      73.6      65.2                    CARD1G02
105.55    101.95    96.44     90.12     83.06     75.77     67.59                   CARD1G03
106.37    102.77    97.26     90.91     84.05     76.79     68.67                   CARD1G04
107.19    103.6     98.09     91.74     85.06     77.84     69.77                   CARD1G05
108.06    104.49    99.03     [illegible] 86.33   79.19     71.17                   CARD1G06
108.68    105.2     [illegible] [illegible] 87.76 80.77     72.9                    CARD1G07
109.1     105.67    100.56    [illegible] 88.6    81.47     73.77                   CARD1G08
109.4     106.14    101.37    [illegible] 89.97   83.35     74.73                   CARD1G09
109.64    106.37    101.6     [illegible] 89.62   82.64     74.26                   CARD1G10
80.       90.       100.      110.      120.                                        CARD1H01
90.       21230.    6680.                                                           CARD1I01
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST                  CARD1L01
TAKEOFF   22B DEF   0.0       430000.   0.        10.       77.                     CARD1M01
1.        0.0       0.0       1.0                           10.                     CARD1N01
[illegible]                                                                         CARD2A01
90.       12100.    6090.                         1                                 CARD2I01
0.5       110000.  10000.   .0001    40.      20.       20.       .05       0.0     CARD2J01
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3.0 G GLIDE SLOPE           CARD2L01
APPROACH  22B       [illegible] 358000. 0.        42.       77.                     CARD2M01
0.        0.        1.        1[illegible].                                         CARD2O01
```

FIGURE 4.2-4 SAMPLE PROGRAM INPUT - NOISE DEFINITION PROGRAM

08-10-74 PAGE 1

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
EFFECTIVE PERCEIVED NOISE LEVEL , EPNDB
NL= 5 NTH= 10 NOIST= 7 IEPNL = 1

DISTANCE	200.	[illegible]	800.	1600.	3200.	6400.	12800.
NI/SQRT(THETA)				WITH EGA			
55.0000	[illegible]	93.03	84.86	74.34	65.80	58.63	50.09
60.0000	94.52	94.96	86.75	75.95	67.34	60.41	52.56
65.0000	101.44	96.67	88.51	78.03	69.57	62.73	55.02
67.4000	102.26	97.69	89.34	79.00	70.58	63.77	56.12
70.0000	103.09	[illegible]	90.19	80.00	71.62	64.85	57.23
75.0000	103.96	[illegible]	91.17	81.23	72.93	66.22	58.65
80.0000	104.07	100.33	92.58	82.91	74.37	67.74	60.33
85.0000	105.11	100.81	93.22	83.68	75.23	68.61	61.17
90.0000	[illegible]	101.31	94.07	84.66	76.26	69.60	61.79
95.0000	105.65	101.57	94.26	84.31	75.87	69.16	61.30
NI/SQRT(THETA)				WITHOUT EGA			
55.0000	101.90	[illegible]	[illegible]	86.57	79.85	72.34	63.21
60.0000	103.63	100.04	94.70	88.38	81.20	[illegible]	65.20
65.0000	105.55	101.95	[illegible]	90.12	83.08	[illegible]	67.59
67.4000	106.37	102.77	97.26	90.91	84.05	[illegible]	68.67
70.0000	107.19	103.66	[illegible]	91.74	85.06	77.84	69.71
75.0000	108.06	104.49	[illegible]	92.74	86.33	[illegible]	71.17
80.0000	[illegible]	[illegible]	[illegible]	94.03	87.76	[illegible]	72.90
85.0000	109.19	[illegible]	100.56	94.83	88.60	81.67	73.77
90.0000	109.40	106.14	101.37	96.00	89.97	[illegible]	74.73
95.0000	109.64	106.27	101.60	96.20	89.62	[illegible]	74.26

CONTOUR LEVELS 90. 90. 100. 110. 120.

RADIATION ANGLE (THETA) 90.
START= 21240. INCREMENT= 6000.

IPCTAB = 0 ICL = 0 ISL = C IBPUN = 0 NSCLND = 0 IPLTFT = 0 NSCLFT = 0
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

TYPE = TAKE ENG 22B OFF VWI = 0.0 W = 430000. HP = 0. FLAP = 10. TAMB = 77.0

DS = 1.0 ACCI = 0.0 SLOPE = 0.0 TFAC = 1.0 CONT = 0.0 CBFAC = 0.0 DELV2 = 10.0

FIGURE 4.2-5a SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

THRUST									
13.9	60300.		0.0	0.2	0.4				
		0.	40203.	33050.	28029.				
		2000.	35393.	31644.	27578.				
		4000.	36509.	30233.	26574.				
		6000.	34521.	28860.	25355.				
		8000.	33190.	27526.	24217.				
		10000.	31561.	26306.	23219.				
20.8	60303.		0.0	0.2	0.4				
		0.	39020.	31100.	27000.				
		2000.	36150.	29830.	26050.				
		4000.	34550.	28600.	25000.				
		6000.	33050.	27250.	23900.				
		8000.	31520.	26050.	22950.				
		10000.	30000.	24900.	21950.				
27.8	60301.		0.0	0.2	0.4				
		0.	36134.	29213.	25258.				
		2000.	34432.	28079.	24241.				
		4000.	32790.	26910.	23449.				
		6000.	31368.	25667.	22448.				
		8000.	29909.	24585.	21430.				
		10000.	28479.	23461.	20624.				
CLS	2.0300	2.1650	2.3330	2.4120	2.5050				
CLCO	11008.0000	0.0	4.0000	10.0000	18.0000	22.0000	27.0000	33.0000	42.0000
	0.7000	0.0457	0.0563	0.0602	0.0686	0.0743	0.0840	0.0962	0.1199
	0.8000	0.0528	0.0640	0.0671	0.0757	0.0814	0.0902	0.1048	0.1249
	0.9000	0.0623	0.0733	0.0759	0.0841	0.0893	0.0976	0.1118	0.1317
	1.0000	0.0764	0.0836	0.0866	0.0942	0.0988	0.1062	0.1229	0.1404
	1.1000	0.0933	0.0963	0.0991	0.1055	0.1095	0.1168	0.1329	0.1516
	1.2000	0.1160	0.1103	0.1129	0.1165	0.1219	0.1291	0.1443	0.1643
	1.3000	0.1500	0.1268	0.1283	0.1328	0.1395	0.1426	0.1578	0.1780
	1.4000	0.2310	0.1444	0.1455	0.1492	0.1522	0.1569	0.1722	0.1929
	1.[illegible]	0.2900	0.1671	0.1648	0.1669	0.1696	0.1763	0.1955	0.2070
	1.5000	0.3400	0.1680	0.1963	0.1669	0.1890	0.1951	0.2076	0.2257
	1.7000	0.3400	0.2100	0.2087	0.2086	0.2107	0.2151	0.2257	0.2440
CLALF	8004.0000	0.0	4.0000	10.0000	18.0000	22.0000	25.0000	33.0000	42.0000
	0.4000	3.9000	4.3000	3.2000	1.7000	1.1000	0.6000	0.0	-1.3000
	0.5200	6.3000	6.3000	5.3000	3.6000	3.0000	2.5000	1.5000	0.7000
	0.7300	8.6000	8.3000	7.3000	5.5000	4.8000	4.4000	3.5000	2.7000
	1.0000	11.0000	10.4000	9.3000	7.5000	6.8000	6.3000	5.4000	4.5000
	1.2000	13.5000	12.6000	11.5000	9.5000	8.8000	8.3000	7.4000	6.5000
	1.4000	16.0000	14.7000	13.6000	11.6000	11.3000	10.5000	9.4000	8.5000
	1.6000	18.8000	17.4000	15.8000	13.6000	13.4000	12.5000	11.5000	10.5000
	1.8000	21.6000	20.2000	18.3000	15.8000	15.3000	14.7000	13.7000	12.6000

FIGURE 4.2-5b SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

FPR	19005.0000	0.1000	0.2000	0.3000	0.4000	0.5000
	4000.0000	1.0590	1.0680	1.0770	1.0810	1.0830
	6000.0000	1.0850	1.1000	1.1150	1.1190	1.1220
	8000.0000	1.1140	1.1320	1.1440	1.1530	1.1590
	10000.0000	1.1450	1.1630	1.1760	1.1860	1.1940
	12000.0000	1.1710	1.1930	1.2100	1.2210	1.2260
	14000.0000	1.2030	1.2240	1.2430	1.2550	1.2600
	16000.0000	1.2260	1.2540	1.2750	1.2880	1.2940
	18000.0000	1.2550	1.2850	1.3060	1.3210	1.3280
	20000.0000	[illegible]	1.3160	1.3400	1.3550	1.3630
	22000.0000	1.3110	1.3470	1.3720	1.3890	1.3970
	24000.0000	1.3440	1.3950	1.4060	1.4250	1.4320
	26000.0000	1.3740	1.4110	1.4400	1.4580	1.4650
	28000.0000	[illegible]	1.4450	1.4740	1.4930	1.5000
	30000.0000	1.4390	1.4780	1.5070	1.5250	1.5330
	32000.0000	1.4650	1.5080	1.5400	1.5600	1.5600
	34000.0000	1.4570	1.5400	1.5730	1.5930	1.6020
	36000.0000	1.5260	1.5720	1.6050	1.6270	1.6360
	38000.0000	1.5570	1.6050	1.6310	1.6590	1.6670
	40000.0000	1.5880	1.6360	1.6720	1.6920	1.7000
KK	0.0467	0.0809	0.0823	0.0853	0.0913	
	0.0577	0.0560	0.0985	0.1017	0.1051	
	1.3000	1.1100	1.3000	1.1100	1.3100	
XN19	27005.0000	0.0	0.1000	0.2000	0.3000	0.4000
	1.1000	47.3000	47.9000	49.2000	51.2000	55.4000
	1.1200	51.3000	51.7000	52.8000	55.4000	58.9000
	1.1400	54.0000	55.4000	56.3000	59.8000	62.1000
	1.1600	56.5000	58.8000	59.9000	62.1000	65.1000
	1.1900	61.9000	62.1000	63.1000	65.3000	67.9000
	1.2000	65.1000	65.3000	66.3000	68.2000	70.5000
	1.2200	67.8000	68.9000	69.9000	70.6000	72.6000
	1.2400	70.2000	70.6000	71.2000	72.7000	74.7000
	1.2600	72.3000	72.6000	73.3000	74.4000	76.6000
	1.2800	74.3000	74.5000	75.2000	76.7000	78.5000
	1.3000	75.9000	76.2000	77.0000	78.5000	80.2000
	1.3200	77.5000	77.9000	79.6000	80.1000	81.7000
	1.3400	79.1000	79.3000	80.2000	81.6000	83.2000
	1.3600	80.5000	80.3000	81.7000	83.1000	84.6000
	1.3800	82.0000	82.3000	83.1000	84.4000	85.9000
	1.4000	83.4000	83.8000	84.6000	85.6000	87.2000
	1.4200	84.7000	85.0000	85.8000	87.0000	88.4000
	1.4400	86.3000	86.3000	87.0000	88.2000	89.5000
	1.4600	87.4000	87.6000	88.2000	89.3000	90.6000
	1.4800	88.7000	88.9000	89.4000	90.5000	91.7000
	1.5000	90.0000	90.1000	90.6000	91.6000	92.9000
	1.5200	91.4000	91.4000	91.6000	92.8000	94.0000
	1.5400	92.4000	92.6000	93.0000	93.9000	95.1000
	1.5600	94.1000	93.9000	94.2000	95.1000	95.6000
	1.5800	95.5000	95.1000	95.4000	96.3000	97.4000
	1.6000	96.3000	96.4000	96.6000	97.4000	98.5000
	1.6200	98.4000	97.9000	98.2000	98.9000	100.0000

FIGURE 4.2-5c SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

DVFPRM	6003.0000	0.0	0.2500	0.5000						
	1.1000	0.0	0.0	0.0						
	1.2000	0.0	-0.9800	-0.9000						
	1.3000	0.0	-0.9000	-1.3000						
	1.4000	0.0	-0.8000	-1.2000						
	1.5000	0.0	-0.2800	-0.6200						
	1.6000	0.0	3.8000	1.0000						
ONALTN	7005.0000	0.0	0.1000	0.2000	0.3000	0.4000				
	0.0	0.0	0.0	0.0	0.0	0.0				
	2000.0000	0.8000	0.0	0.0	0.0	0.0				
	4000.0000	1.5000	0.7000	0.0	0.0	0.0				
	6000.0000	2.2000	1.1000	0.0	0.0	0.0				
	8000.0000	2.7000	1.9000	0.6000	0.0	0.0				
	10000.0000	4.3000	2.4000	1.6000	0.0	0.0				
	12000.0000	4.1000	3.6000	2.6000	1.0000	0.0				
VSTC	27005.0000	0.0	0.1000	0.2000	0.3000	0.4000				
	1.1040	47.[illegible]	48.1000	49.4000	51.5000	54.2000				
	1.1240	51.1000	51.7000	52.7000	54.9000	57.7000				
	1.1440	54.7000	55.1000	56.1000	58.2000	60.8000				
	1.1640	58.0000	58.4000	59.3000	61.3000	63.6000				
	1.1840	61.2000	61.5000	62.5000	64.3000	66.2000				
	1.2040	64.1000	64.5000	65.4000	66.9000	68.6000				
	1.2240	67.[illegible]	67.1000	68.0000	69.3000	70.6000				
	1.2440	69.3000	69.6000	70.3000	71.5000	72.8000				
	1.2640	71.5000	71.7000	72.4000	73.5000	74.8000				
	1.2840	73.6000	73.7000	74.4000	75.5000	76.8000				
	1.3040	75.7000	75.5000	76.2000	77.3000	78.5000				
	1.3240	76.9000	77.2000	77.9000	79.0000	80.1000				
	1.3440	78.4000	78.7000	79.4000	80.5000	81.5000				
	1.3640	79.6000	80.1000	80.7000	81.9000	82.8000				
	1.3840	81.3000	81.5000	82.3000	83.2000	84.0000				
	1.4040	82.7000	83.0000	83.6000	84.5000	85.3000				
	1.4240	84.1000	84.4000	85.0000	85.8000	86.6000				
	1.4440	85.5000	85.8000	86.4000	87.1000	87.9000				
	1.4640	87.0000	87.2000	87.7000	88.4000	89.2000				
	1.4840	88.5000	88.6000	89.1000	89.8000	90.5000				
	1.5040	89.9000	90.0000	90.5000	91.1000	91.7000				
	1.5240	91.3000	91.3000	91.3000	92.4000	93.0000				
	1.5440	92.8000	92.6000	93.1000	93.8000	94.2000				
	1.5640	94.2000	93.9000	94.3000	94.8000	95.4000				
	1.5840	95.6000	95.2000	95.5000	96.0000	96.4000				
	1.6040	96.8000	96.3000	96.6000	97.1000	97.3000				
	1.6240	98.2000	97.3000	97.5000	98.0000	98.4000				
ONALTC	0.0	0.0	2000.0000	0.0400	4000.0000	0.0900	6000.0000	0.1500	8000.0000	0.2200
	10000.0000									

FIGURE 4.2-5d SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

08-10-74 PAGE 5

FLOW	13063.0000	0.0	0.2000	0.4000
	1.1000	3.4000	3.3500	3.2000
	1.1200	3.2500	3.0750	2.9000
	1.1400	3.1000	1.7750	1.5500
	1.1600	2.8000	2.5250	2.2500
	1.1800	2.5000	2.2000	1.9000
	1.2000	2.4000	2.0500	1.9000
	1.2200	2.3500	1.9250	1.8000
	1.2400	1.9000	1.8000	1.8000
	1.2600	1.6000	1.6000	1.6000
	1.2900	1.3500	1.3500	1.3500
	1.3000	1.1000	1.1000	1.1000
	1.3500	1.0000	1.0000	1.0000
	1.5000	1.1000	1.0000	1.0000

FIGURE 4.2-5e SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

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MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST   08-10-74   PAGE 6

FLAPS=10. DEG TEMP= 77.0 DEG F WIND= 0.0 KT SLOPE=0.0 ACCL = 0.0 KT/SEC

SEGMENT	PRESSURE ALTITUDE (FT)	GEOMETRIC ALTITUDE (FT)	TOTAL DISTANCE (FT)	TOTAL TIME (SEC)	THRUST (LB)	SPEED (KTAS)	MACH	ALPHA (DEG)	PITCH (DEG)	GRAD	TEMP (DEG F)	EPR	N1/SQRT(THETA) (PCT)	ROC (FPM)	FLAP (DEG)
HOP	0. WEIGHT=	430000. EPR=	1.533 ISA+	10.0 DEG C.				PB.211-22B	ALTEO OFF						
TO-ROT	0.	0.	5519.	43.1	32076.	156.7	.233	****	****	****	77.0	1.521	92.41	*****	10.
LFT-OFF	0.	0.	6571.	47.0	31643.	167.1	.248	****	****	****	77.0	1.519	92.41	*****	10.
LOF-35FT	34.	35.	7870.	51.5	31333.	174.1	.259	****	****	****	76.9	1.519	92.43	*****	10.
35F-CU	332.	344.	11739.	64.5	31008.	177.9	.265	****	****	****	75.8	1.520	92.66	*****	10.
[illegible]	662.	706.	14751.	74.5	30769.	178.5	.266	11.6	18.3	.116	74.6	1.523	92.94	2095.	10.
[illegible]	1029.	1065.	17777.	84.5	30531.	179.8	.268	11.6	18.2	.114	73.3	1.526	93.21	2075.	10.
[illegible]	1372.	1421.	20815.	94.5	30292.	180.7	.270	11.6	18.1	.112	72.1	1.529	93.48	2056.	10.
[illegible]	1713.	1773.	23877.	104.5	30054.	181.6	.271	11.6	18.0	.111	70.9	1.532	93.75	2036.	10.
[illegible]	2049.	2121.	26950.	114.5	29814.	182.5	.273	11.6	17.9	.109	69.7	1.534	94.01	2016.	10.
[illegible]	2381.	2467.	30037.	124.5	29565.	183.5	.275	11.6	17.8	.107	68.5	1.537	94.25	1994.	10.
[illegible]	2712.	2803.	33133.	134.5	29319.	184.4	.277	11.6	17.7	.106	67.3	1.539	94.49	1972.	10.
[illegible]	3031.	3140.	36242.	144.5	29077.	185.2	.278	11.6	17.6	.104	66.2	1.542	94.74	1950.	10.
[illegible]	3361.	3480.	39357.	154.5	28839.	186.2	.280	11.6	17.5	.102	65.0	1.544	94.99	1929.	10.
[illegible]	3675.	3810.	42477.	164.5	28606.	187.1	.281	11.6	17.4	.101	63.9	1.547	95.24	1907.	10.
[illegible]	3985.	4137.	45712.	174.5	28372.	188.0	.283	11.6	17.3	.099	62.8	1.549	95.50	1886.	10.
[illegible]	4336.	4460.	48862.	184.5	28142.	188.9	.285	11.6	17.2	.098	61.7	1.551	95.74	1865.	10.
[illegible]	4614.	4780.	52067.	194.5	27915.	189.7	.286	11.6	17.1	.096	60.5	1.554	95.99	1843.	10.
[illegible]	4915.	5096.	55297.	204.5	27692.	190.6	.288	11.6	17.1	.095	59.5	1.556	96.24	1822.	10.
[illegible]	5226.	5408.	58522.	214.5	27472.	191.5	.290	11.6	17.0	.093	58.4	1.558	96.49	1801.	10.
[illegible]	5518.	5717.	61761.	224.5	27256.	192.4	.291	11.6	16.9	.091	57.3	1.561	96.74	1781.	10.
[illegible]	5812.	6022.	65016.	234.5	27043.	193.2	.293	11.6	16.8	.090	56.3	1.563	96.99	1760.	10.
[illegible]	6103.	6324.	68275.	244.5	26831.	194.1	.295	11.6	16.7	.089	55.2	1.565	97.24	1739.	10.
[illegible]	6390.	6622.	71558.	254.5	26619.	195.0	.296	11.6	16.6	.087	54.2	1.567	97.49	1718.	10.
[illegible]	6674.	6916.	74866.	264.5	26412.	195.8	.298	11.6	16.6	.086	53.2	1.569	97.74	[illegible]	10.
[illegible]	6954.	7207.	78175.	274.5	26212.	196.7	.299	11.6	16.5	.084	52.2	1.571	97.99	1677.	10.
[illegible]	7231.	7495.	81505.	284.5	26016.	197.6	.301	11.6	16.4	.083	51.2	1.573	98.24	1658.	10.
[illegible]	7505.	7780.	[illegible]	294.5	25826.	198.4	.302	11.6	16.3	.082	50.2	1.576	98.48	1638.	10.
[illegible]	7776.	8061.	88201.	304.5	25641.	199.2	.304	11.6	16.2	.080	49.3	1.578	98.72	1620.	10.
[illegible]	8043.	8339.	91570.	314.5	25461.	200.0	.306	11.6	16.2	.079	48.3	1.580	98.97	1601.	10.
[illegible]	8303.	8614.	94944.	324.5	25286.	200.9	.307	11.6	16.1	.078	47.4	1.582	99.21	1583.	10.
[illegible]	8570.	8886.	98351.	334.5	25115.	201.7	.309	11.6	16.0	.077	46.5	1.584	99.45	1566.	10.
[illegible]	8828.	9155.	101772.	344.5	24949.	202.5	.310	11.6	16.0	.076	45.5	1.586	99.70	1549.	10.
[illegible]	9086.	9421.	105197.	354.5	24788.	203.3	.312	11.6	15.9	.074	44.6	1.589	99.95	1532.	10.
GU*XXXX	9338.	9685.	108626.	364.5	24631.	204.1	.313	11.6	15.8	.073	43.7	1.591	100.19	1516.	10.
GU*XXXX	9558.	9945.	112070.	374.5	24478.	205.0	.315	11.6	15.8	.072	42.8	1.593	100.44	1500.	10.

ACC = 0.0 KT/SEC   CDFAC USED = 1.0

FIGURE 4.2-5f SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR NORMAL TAKEOFF

08-10-74 PAGE 7

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

NOISE LEVELS ALONG THE FLIGHT PATH

X	H	V	N1/SQRT(THETA)	XP	LCL	R	XPP	LSL
5515.	0.	156.7	92.41	5515.	******	1520.	5515.	85.30
6575.	0.	157.1	92.41	6575.	******	1520.	6575.	85.02
7870.	35.	174.1	92.41	7870.	118.40	1520.	7870.	87.45
11739.	344.	177.9	92.66	11739.	106.19	1558.	11739.	91.13
14751.	706.	178.9	92.94	14751.	101.79	1676.	14751.	93.47
17777.	1365.	179.8	93.21	17777.	98.79	1856.	17777.	94.26
20819.	1423.	180.7	93.45	20819.	96.54	2050.	20819.	93.18
21280.	1474.	180.8	93.52	21280.	96.25	2117.	21280.	93.92
23877.	1773.	181.6	93.75	23877.	94.65	2335.	23877.	92.09
26950.	2121.	182.5	94.01	26950.	92.95	2610.	26950.	91.07
27369.	2167.	182.7	94.04	27369.	92.75	2647.	27369.	90.89
30039.	2457.	183.5	94.25	30039.	91.52	2897.	30039.	90.01
33143.	2818.	184.4	94.49	33143.	90.27	3193.	33143.	89.06
33440.	2843.	184.4	94.52	33440.	90.16	3221.	33440.	88.97
36262.	3146.	185.3	94.74	36262.	89.16	3494.	36262.	88.12
39397.	3480.	186.2	94.99	39397.	88.12	3797.	39397.	87.24
39520.	3493.	186.2	95.00	39520.	88.08	3809.	39520.	87.21
42547.	3810.	187.1	95.24	42547.	87.17	4102.	42547.	86.42
45600.	4125.	187.9	95.49	45600.	86.33	4397.	45600.	85.69
45712.	4137.	188.0	95.50	45712.	86.30	4408.	45712.	85.66
48892.	4463.	188.9	95.74	48892.	85.50	4712.	48892.	84.95
51680.	4739.	189.6	95.96	51680.	84.65	4977.	51680.	84.36
52087.	4780.	189.7	95.99	52087.	84.76	5016.	52087.	84.26
55297.	5096.	190.6	96.24	55297.	84.08	5318.	55297.	83.65
57760.	5334.	191.3	96.43	57760.	83.59	5547.	57760.	83.19
58522.	5408.	191.5	96.49	58522.	83.44	5618.	58522.	83.05
61761.	5717.	192.4	96.74	61761.	82.84	5915.	61761.	82.49
63840.	5912.	192.9	96.90	63840.	82.47	6104.	63840.	82.15
65016.	6022.	193.3	96.99	65016.	82.27	6211.	65016.	81.96
68285.	6324.	194.1	97.24	68285.	81.74	6504.	68285.	81.42
69920.	6472.	194.5	97.37	69920.	81.46	6648.	69920.	81.14
71568.	6522.	195.0	97.49	71568.	81.16	6794.	71568.	80.85
74866.	6916.	195.8	97.74	74866.	80.60	7031.	74866.	80.31
76000.	7016.	196.1	97.83	76000.	80.41	7179.	76000.	80.13
78178.	7207.	196.7	97.99	78178.	80.06	7396.	78178.	79.79
81505.	7495.	197.5	98.24	81505.	79.54	7698.	81505.	79.30
82090.	7544.	197.7	98.28	82060.	79.46	7676.	82090.	79.21
84846.	7780.	198.4	98.48	84846.	79.05	7927.	84846.	78.82
88160.	8357.	199.2	98.72	88160.	78.58	8199.	88160.	78.37

FIGURE 4.2-5g SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL 08-10-74 PAGE 8
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

EFFECTIVE PERCEIVED NOISE LEVEL 80. EPNDB

X	H	V	N1/SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
5515.	0.	156.7	92.41	8280.	2364.	2364.	5515.	2364.	0.0
6575.	0.	167.1	92.41	7768.	2218.	2218.	6575.	2218.	0.17
7870.	35.	174.1	92.43	7451.	2120.	2128.	7870.	2127.	0.38
11739.	344.	177.9	92.60	7280.	2079.	3530.	11739.	3514.	1.16
14751.	706.	178.9	92.94	7228.	2065.	4032.	14751.	3970.	1.57
17777.	1065.	179.8	93.21	7177.	2051.	4415.	17777.	4284.	2.26
20819.	1420.	180.7	93.49	7127.	2037.	4731.	20819.	4544.	3.63
21280.	1474.	180.6	93.52	7119.	2035.	4812.	21280.	4581.	3.56
23877.	1773.	181.6	93.75	7077.	2024.	5133.	23877.	4785.	4.85
26950.	2121.	182.5	94.01	7028.	2013.	5457.	26950.	5028.	5.93
27360.	2167.	182.7	94.04	7022.	2008.	5505.	27360.	5061.	6.08
30039.	2467.	183.5	94.25	[illegible]	1997.	5830.	30039.	5282.	7.07
33143.	2818.	184.4	94.49	6935.	1984.	6221.	33143.	5551.	8.29
33440.	2840.	184.4	94.52	6930.	1983.	6254.	33440.	5577.	8.40
36262.	3146.	185.3	94.74	6889.	1972.	6617.	36262.	5821.	9.55
39397.	3490.	186.2	94.99	6843.	1959.	6813.	39397.	5892.	10.27
39520.	3493.	186.2	95.00	6841.	1959.	6816.	39520.	5882.	10.52
42547.	3810.	187.1	95.24	6798.	1947.	6798.	42547.	5630.	12.11
45600.	4126.	187.9	95.49	6755.	1935.	6755.	45600.	5349.	13.37
45712.	4137.	188.0	95.50	6753.	1935.	6753.	45712.	5338.	13.42
48892.	4460.	188.9	95.74	6710.	1922.	6710.	48892.	5012.	14.60
51680.	4739.	189.6	95.96	6672.	1912.	6672.	51680.	4691.	15.57
52087.	4780.	189.7	95.99	6666.	1911.	6666.	52087.	4647.	15.70
55297.	5096.	190.6	96.24	6624.	1899.	6624.	55297.	4232.	16.73
57760.	5334.	191.3	96.43	6591.	1890.	6591.	57760.	3872.	17.44
58522.	5408.	191.5	96.49	6581.	1887.	6581.	58522.	3751.	17.65
61761.	5717.	192.4	96.74	6540.	1876.	6540.	61761.	3176.	18.46
63840.	5912.	192.9	96.90	6513.	1869.	6513.	63840.	2734.	18.90
65016.	6022.	193.3	96.99	6499.	1864.	6499.	65016.	2443.	19.12
68285.	6324.	194.1	97.24	6458.	1853.	6458.	68285.	1311.	19.56
69591.	6472.	194.5	97.37	6438.	1848.	6438.	69591.	0.	19.62

FIGURE 4.2-5h SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

08-10-74 PAGE 9

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

EFFECTIVE PERCEIVED NOISE LEVEL 90. EPNDB

X	H	V	N1/ SQRT(THETA)	R1	R2	K	DISTANCE	1/2 WIDTH	AREA
5515.	0.	156.7	92.41	3199.	1101.	1101.	5515.	1101.	0.0
6575.	0.	167.1	92.41	3001.	1033.	1033.	6575.	1033.	0.08
7870.	35.	174.1	92.43	2879.	991.	1291.	7970.	1291.	0.19
11734.	344.	177.9	92.88	2812.	969.	1738.	11739.	1724.	0.61
14791.	706.	179.5	92.44	2792.	964.	2018.	14751.	1965.	1.01
17777.	1065.	179.8	93.21	2772.	959.	2443.	17777.	2298.	1.46
23019.	1420.	180.7	93.48	2753.	954.	2733.	20919.	2350.	1.96
21280.	1474.	180.8	93.52	2750.	953.	2730.	21280.	2322.	2.03
23877.	1773.	181.6	93.79	2733.	949.	2733.	23877.	2081.	2.44
26950.	2121.	182.5	94.01	2714.	944.	2714.	26950.	1693.	2.86
27320.	2167.	182.7	94.04	2712.	943.	2712.	27300.	1630.	2.91
30039.	2467.	183.5	94.21	2696.	939.	2696.	30039.	1068.	3.17
33143.	2868.	184.4	94.49	2678.	934.	2678.	32020.	0.	3.25

FIGURE 4.2-51 SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

08-10-74 PAGE 1C

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEC. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

EFFECTIVE PERCEIVED NOISE LEVEL 100. EPNDB

X	H	V	R1/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
5515.	0.	156.7	92.41	988.	439.	439.	5515.	439.	0.0
6575.	0.	167.1	92.41	927.	412.	412.	6575.	412.	0.03
7670.	35.	174.1	92.43	869.	395.	510.	7370.	528.	0.06
11739.	344.	177.5	92.66	872.	387.	710.	11739.	711.	0.25
14751.	706.	178.9	92.94	868.	385.	838.	14751.	536.	0.38
17777.	1065.	179.9	93.21	865.	384.	845.	16109.	0.	0.46

FIGURE 4.2-5j SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

08-10-74 PAGE 11

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

EFFECTIVE PERCEIVED NOISE LEVEL 110. EPNDB

X	H	V	N1/SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
5515.	0.	155.7	92.41	186.	105.	105.	5515.	105.	0.0
6575.	0.	167.1	92.41	175.	98.	86.	6575.	98.	0.01
7873.	35.	174.1	92.43	168.	94.	130.	7870.	131.	0.02
11739.	344.	177.9	92.60	165.	93.	135.	9261.	0.	0.02

FIGURE 4.2-5k SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF

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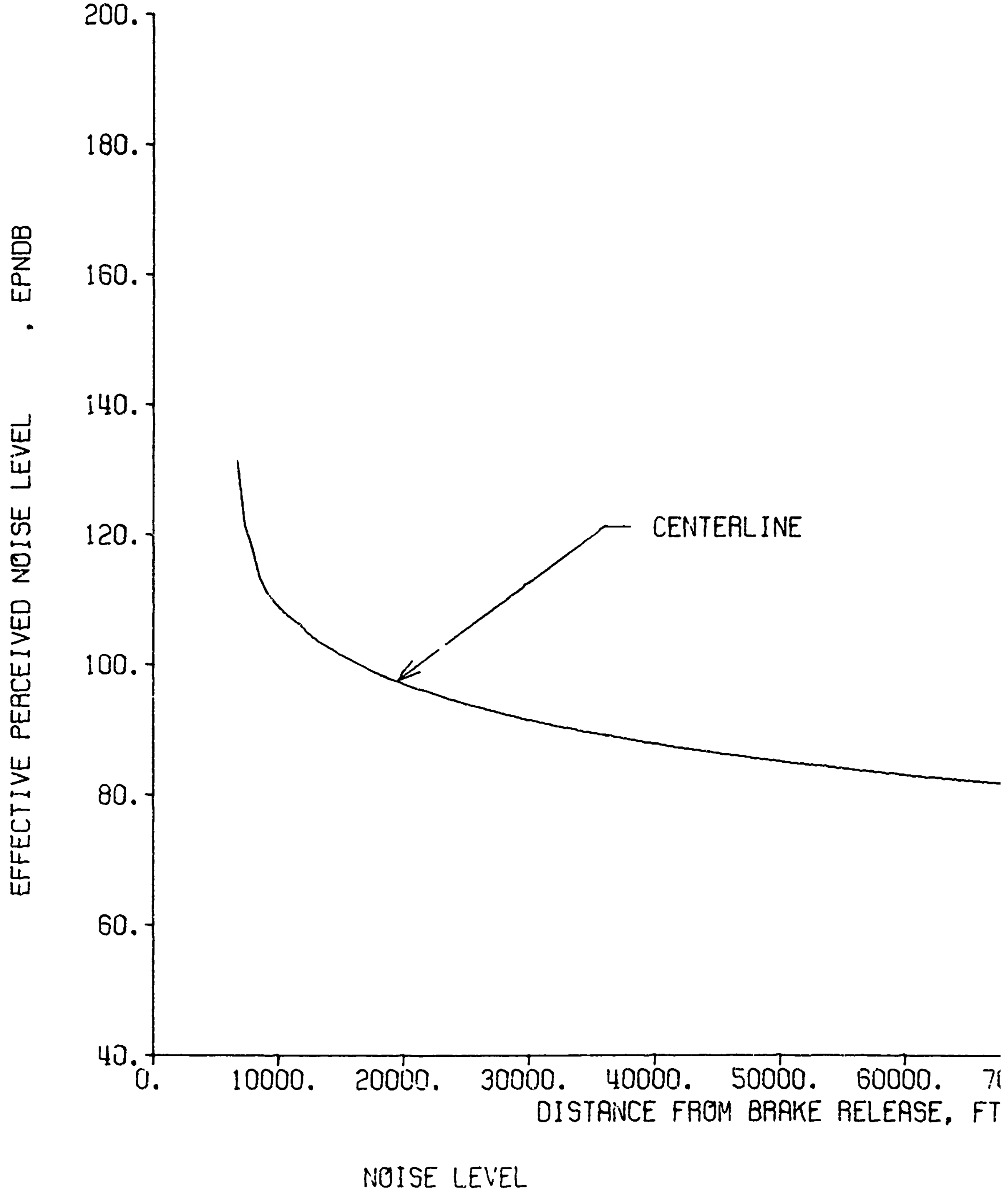
                                                                        08-10-74          PAGE  12
L-1011-1 / 28211-228  EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

EFFECTIVE PERCEIVED NOISE LEVEL       120. EPNDB
```

X	H	V	AI/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
5515.	0.	156.7	92.41	28.	24.	24.	5515.	24.	0.0
6575.	0.	167.1	92.41	27.	22.	22.	6575.	22.	0.00
7870.	35.	174.1	92.43	25.	21.	25.	7481.	0.	0.00

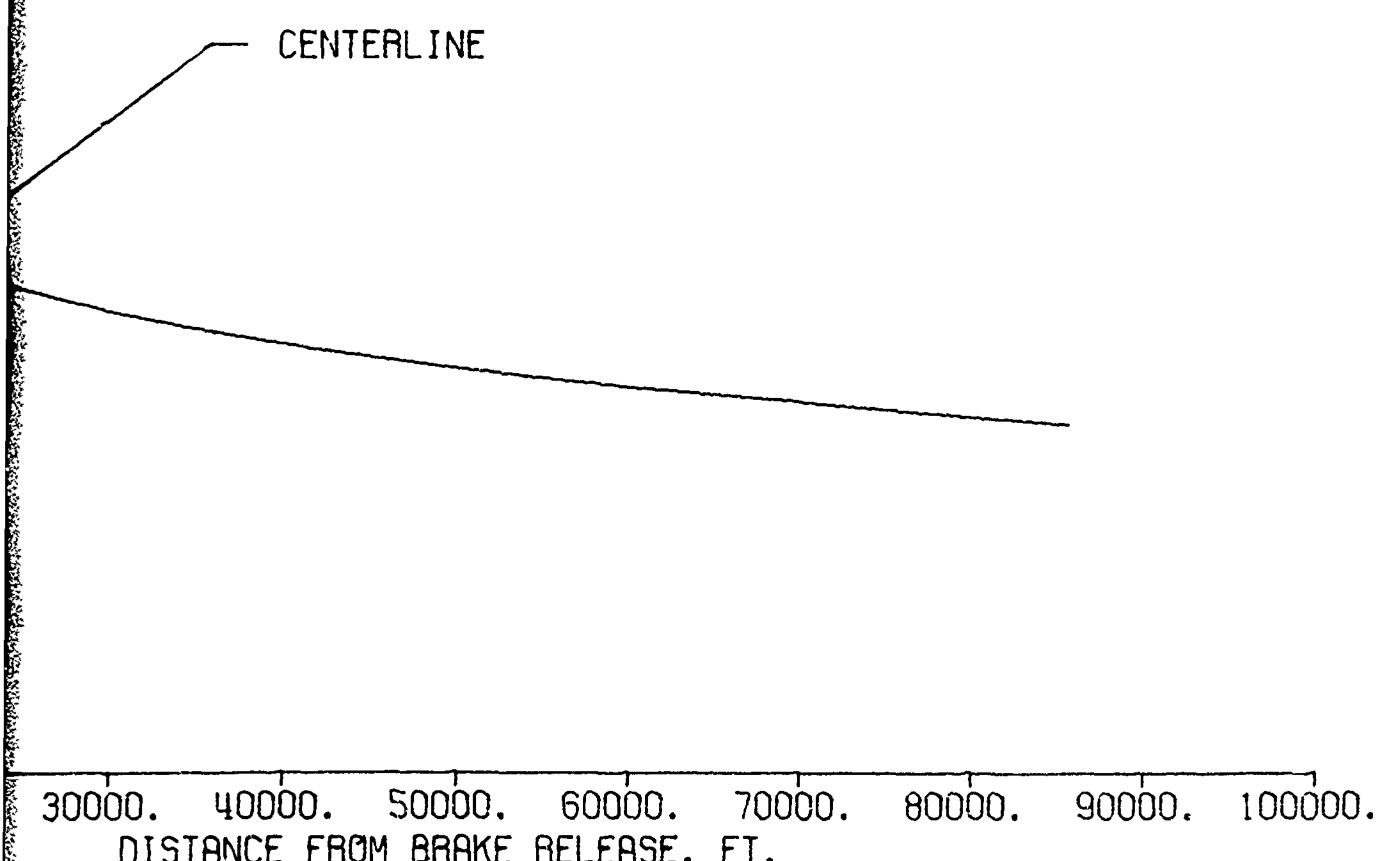
FIGURE 4.2-51 SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A NORMAL TAKEOFF



NOISE LEVEL
L-1011-1 / RB211-22B EFFECTIVE PERCEIVED N
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDI
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DE

FIGURE 4.2-6a SAMPLE PROGRAM OUTPUT – PLOT DATA FOR A NORMAL TAKEOFF

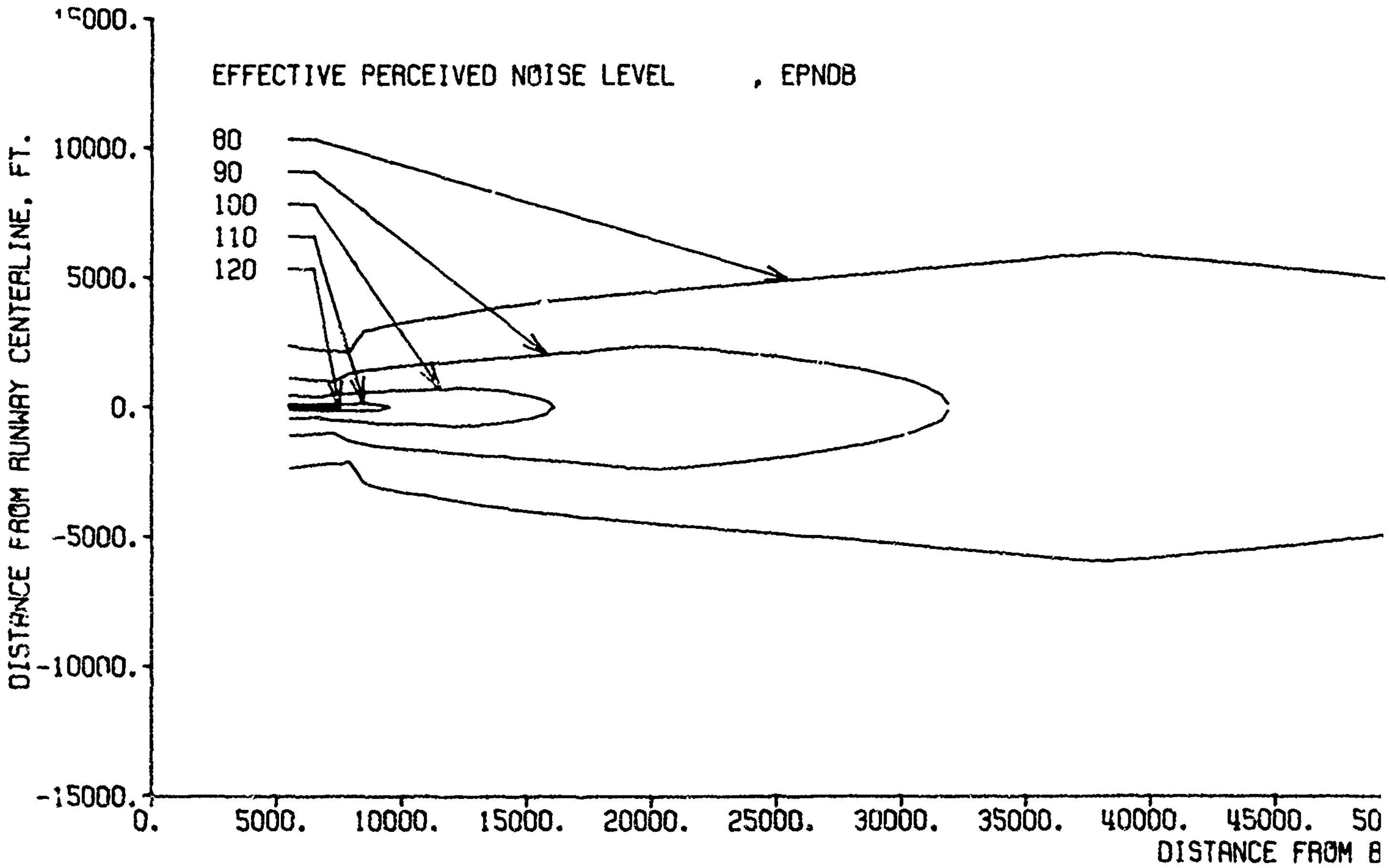
A



LEVEL
-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
VEL, 77 DEG. F., 70% RELATIVE HUMIDITY
M TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

GRAM OUTPUT – PLOT DATA FOR A NORMAL TAKEOFF

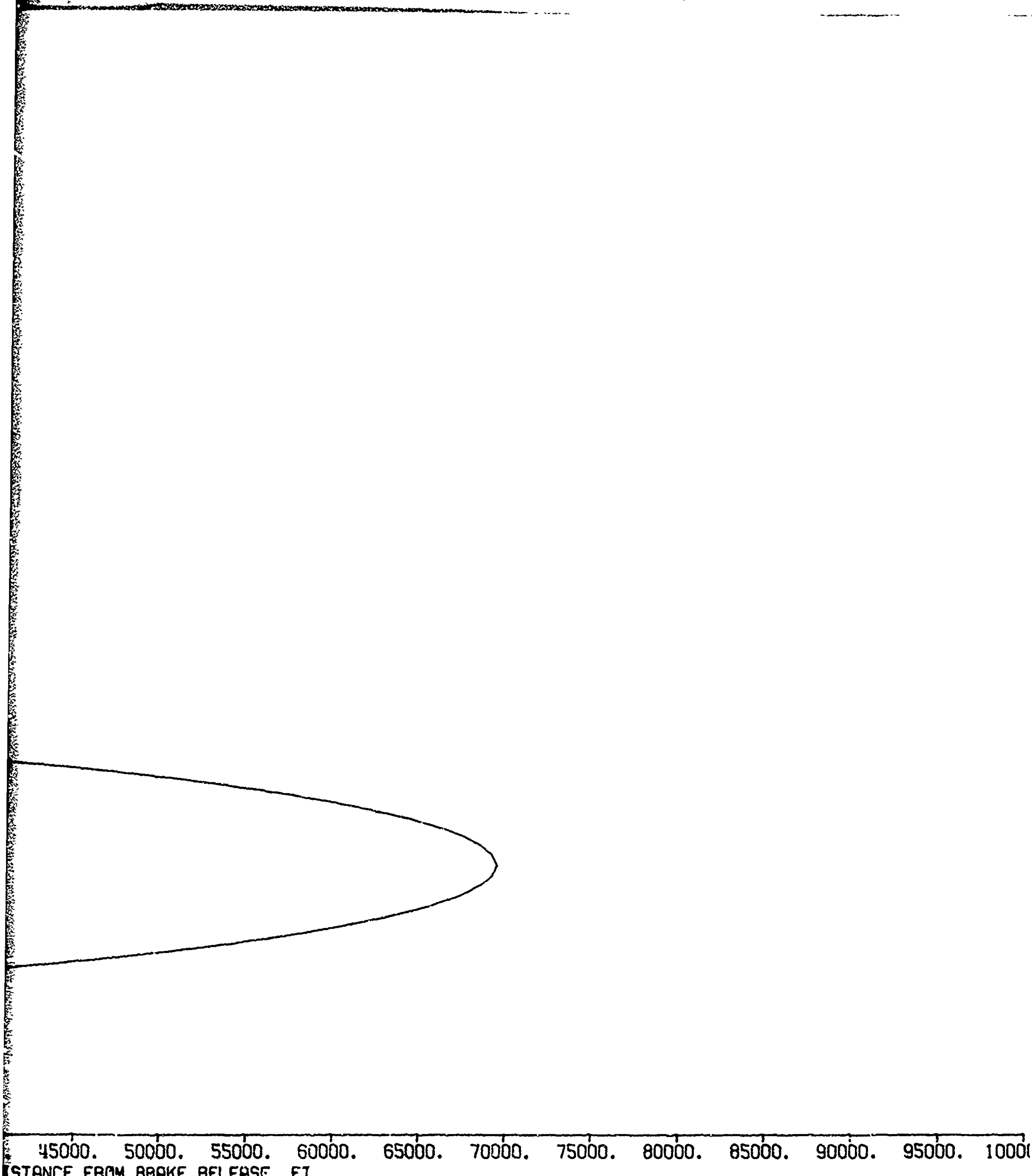
B



CONTOUR PLOTS
L-1011-1 / RB211-228 EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM TAKEOFF WEIGHT (430,000LB.), 10 DEG. FLAPS, TAKEOFF THRUST

FIGURE 4.2-6b SAMPLE PROGRAM OUTPUT – PLOT DATA FOR A NORMAL TAKEOFF

A



KEOFF THRUST

B

4.2.3 Approach Noise

The second sample case for the Noise Definition Program is a normal approach at the certification condition. The input data are listed with the input data for the takeoff case (Figure 4.2-4). The output tabulation is shown as Figure 4.2-7a through g, and computer plots of centerline noise and maximum noise contours are shown on Figure 4.2-8a and b.

```
                                                         08-10-74         PAGE  13
 RADIATION ANGLE (THETA)  SC.
 START= 12160.  INCREMENT=  60EC.

 IPLTND = 0  ICL = 0  ISL = C  IAGTH = 0  NSCLND = 1  IPLTFT = 0  NSCLFT = 0
NEW SCALE FACTORS FOR NOISE LEVEL PLOTS
HMIN =         0.  HMAX =   110000.  DH =     10000.  HSCL =0.000100
VMIN =        40.  VMAX =      200.  DV =        20.  VSCL =  0.0500  CINT =     0.
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

TYPED =    APPR  ENG =228        VWI =  0.0  W = 358000.  HP =     0.  FLAP = 42.  TAMB = 77.0

THI =     0.  GAMMA =  C.C  DLC =1.0  DELV = 10.00
```

FIGURE 4.2-7a SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

08-10-74 PAGE 14

MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

H(I)	PRESSURE ALTITUDE (FT)	GEOMETRIC ALTITUDE (FT)	TOTAL DISTANCE (FT)	THRUST (LB)	SPEED (KTAS)	MACH	TEMP (DEG F)	IFPR	N1/ SQRT(THETA) (PCT)	FLAP (DEG)
50.	48.	50.	0.	12292.	152.3	.226	76.8	1.203	66.27	42.
370.	358.	370.	6000.	12292.	153.0	.229	75.7	1.205	65.61	42.
1417.	1365.	1417.	26000.	12292.	155.3	.232	72.1	1.213	67.69	42.
2464.	2380.	2464.	46000.	12292.	157.7	.236	68.5	1.222	68.73	42.
3515.	3394.	3515.	66000.	12292.	160.1	.241	64.9	1.231	69.78	42.

FIGURE 4.2-7b SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL 08-10-74 PAGE 15
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

NOISE LEVELS ALONG THE FLIGHT PATH

X	H	V	N1/SQRT(THETA)	XP	LCL	R	XPP	LSL
0.	50.	152.3	[illegible]	0.	114.31	1521.	0.	82.68
6080.	370.	153.0	66.01	6080.	102.70	1564.	6080.	86.40
12160.	688.	153.7	66.56	12160.	98.35	1669.	12160.	88.55
18240.	1006.	154.4	67.27	18240.	95.27	1823.	18240.	89.73
24320.	1325.	155.1	67.60	24320.	92.84	2016.	24320.	88.82
26080.	1417.	155.3	67.69	26080.	92.25	2078.	26080.	88.55
30400.	1643.	155.8	67.92	30400.	90.93	2238.	30400.	87.89
36480.	1961.	156.5	68.24	36480.	89.27	2491.	36480.	86.96
42560.	2279.	157.2	68.55	42560.	87.89	2740.	42560.	86.09
46080.	2464.	157.7	68.73	46080.	87.18	2895.	46080.	85.61
48640.	2598.	158.0	68.86	48640.	86.71	3010.	48640.	85.27
54720.	2918.	158.7	69.18	54720.	85.68	3290.	54720.	84.49
60800.	3237.	159.4	69.51	60800.	84.76	3576.	60800.	83.72
66040.	3515.	160.1	69.76	66080.	84.00	3829.	66040.	83.10
66880.	3557.	160.2	69.8[illegible]	66880.	83.89	3868.	66880.	83.01
72960.	3876.	160.9	70.15	72960.	83.08	4164.	72960.	82.33
79040.	4196.	161.6	70.47	79040.	82.32	4462.	79040.	81.67
85120.	4515.	162.4	70.79	85120.	81.62	4764.	85120.	81.06
91200.	4835.	163.1	71.11	91200.	80.97	5068.	91200.	80.46
97280.	5154.	163.9	71.43	97280.	80.37	5374.	97280.	79.94
103360.	5474.	164.6	71.76	103360.	79.81	5681.	103360.	79.43
109440.	5793.	165.3	72.08	109440.	79.29	5989.	109440.	78.95
115520.	6113.	166.1	72.40	115520.	78.80	6299.	115520.	78.49

FIGURE 4.2-7c SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL 08-10-74 PAGE 16
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

EFFECTIVE PERCEIVED NOISE LEVEL 80. EPNDB

X	H	V	N1/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
0.	50.	152.3	66.27	4734.	1526.	2002.	0.	2001.	0.0
6080.	376.	153.0	66.61	4776.	1533.	2664.	6080.	2639.	1.01
12160.	688.	153.7	66.94	4816.	1539.	3036.	12160.	2957.	2.23
18240.	1006.	154.4	67.27	4857.	1545.	3363.	18240.	3209.	3.58
24320.	1125.	155.1	67.60	4896.	1551.	3632.	24320.	3446.	5.03
26080.	1417.	155.3	67.69	4908.	1553.	3790.	26080.	3515.	5.47
30400.	1643.	155.8	67.92	4934.	1557.	4040.	30400.	[illegible]	6.58
36480.	1961.	156.5	68.23	4970.	1563.	4415.	36480.	3956.	8.25
42560.	2279.	157.2	68.55	5007.	1568.	4837.	42560.	4233.	10.04
46080.	2464.	157.7	68.73	5029.	1571.	5012.	46080.	4365.	11.12
48640.	2598.	158.0	68.86	5045.	1574.	5045.	48640.	4325.	11.92
54720.	2918.	158.7	69.18	5083.	1580.	5083.	54720.	4163.	13.77
60800.	3237.	159.4	69.51	5122.	1585.	5122.	60800.	3970.	15.55
66080.	3515.	160.1	69.76	5156.	1590.	5156.	66080.	3773.	17.01
66880.	3557.	160.2	69.83	5162.	1591.	5162.	66880.	3741.	17.23
72960.	3876.	160.9	70.15	5192.	1596.	5192.	72960.	3454.	18.60
79040.	4196.	161.6	70.47	5211.	1599.	5211.	75040.	3090.	20.22
85120.	4515.	162.4	70.79	5230.	1602.	5230.	85120.	2640.	21.47
91200.	4835.	163.1	71.11	5250.	1606.	5250.	91200.	2047.	22.50
97280.	5154.	163.9	71.43	5270.	1609.	5270.	97280.	1093.	23.18
103360.	5474.	164.6	71.76	5290.	1612.	5290.	99628.	0.	23.27

FIGURE 4.2-7d SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

08-10-74 PAGE 17

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

EFFECTIVE PERCEIVED NOISE LEVEL 90. EPNDB

X	H	V	R1/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
0.	50.	152.3	66.77	1775.	763.	1091.	0.	1000.	0.0
6080.	370.	153.0	66.61	1787.	768.	1333.	6080.	1281.	0.50
12160.	688.	153.7	66.94	1796.	772.	1636.	12160.	1451.	1.09
18240.	1006.	154.4	67.27	1810.	777.	1910.	18240.	1504.	1.74
[illegible]	1325.	155.1	67.60	1822.	781.	1122.	24320.	1251.	2.34
[illegible]	1417.	155.3	67.69	1825.	782.	1825.	[illegible]	1151.	2.49
30400.	1643.	155.8	67.92	1833.	784.	1833.	30400.	813.	2.79
[illegible]	1841.	156.5	68.23	1845.	788.	1845.	34171.	0.	2.90

FIGURE 4.2-7e SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

08-10-74 PAGE 18

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

EFFECTIVE PERCEIVED NOISE LEVEL 100. EPNDB

X	H	V	A1/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
0.	50.	152.3	66.[illegible]7	543.	270.	377.	0.	374.	0.0
6080.	370.	153.0	66.61	549.	273.	549.	6080.	406.	0.17
12160.	688.	153.7	66.94	555.	276.	555.	9570.	0.	0.22

FIGURE 4.2-7f SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH

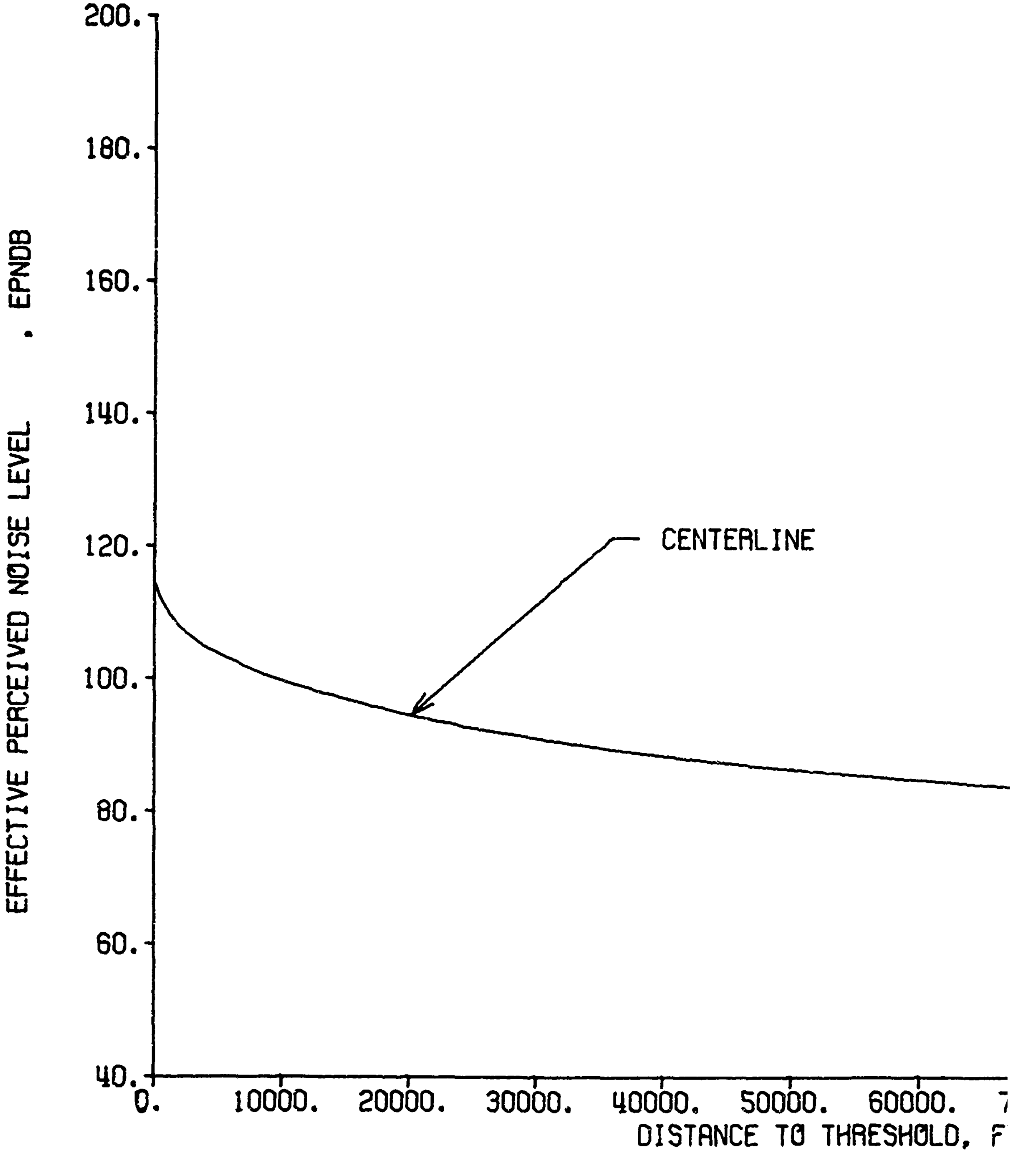
UB-... PAGE 19

L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG. GLIDE SLOPE

EFFECTIVE PERCEIVED NOISE LEVEL 110. EPNDB

X	H	V	R1/ SQRT(THETA)	R1	R2	R	DISTANCE	1/2 WIDTH	AREA
0.	50.	152.3	66.27	106.	70.	105.	0.	92.	0.0
6000.	370.	153.0	66.61	107.	71.	107.	1047.	0.	0.0C

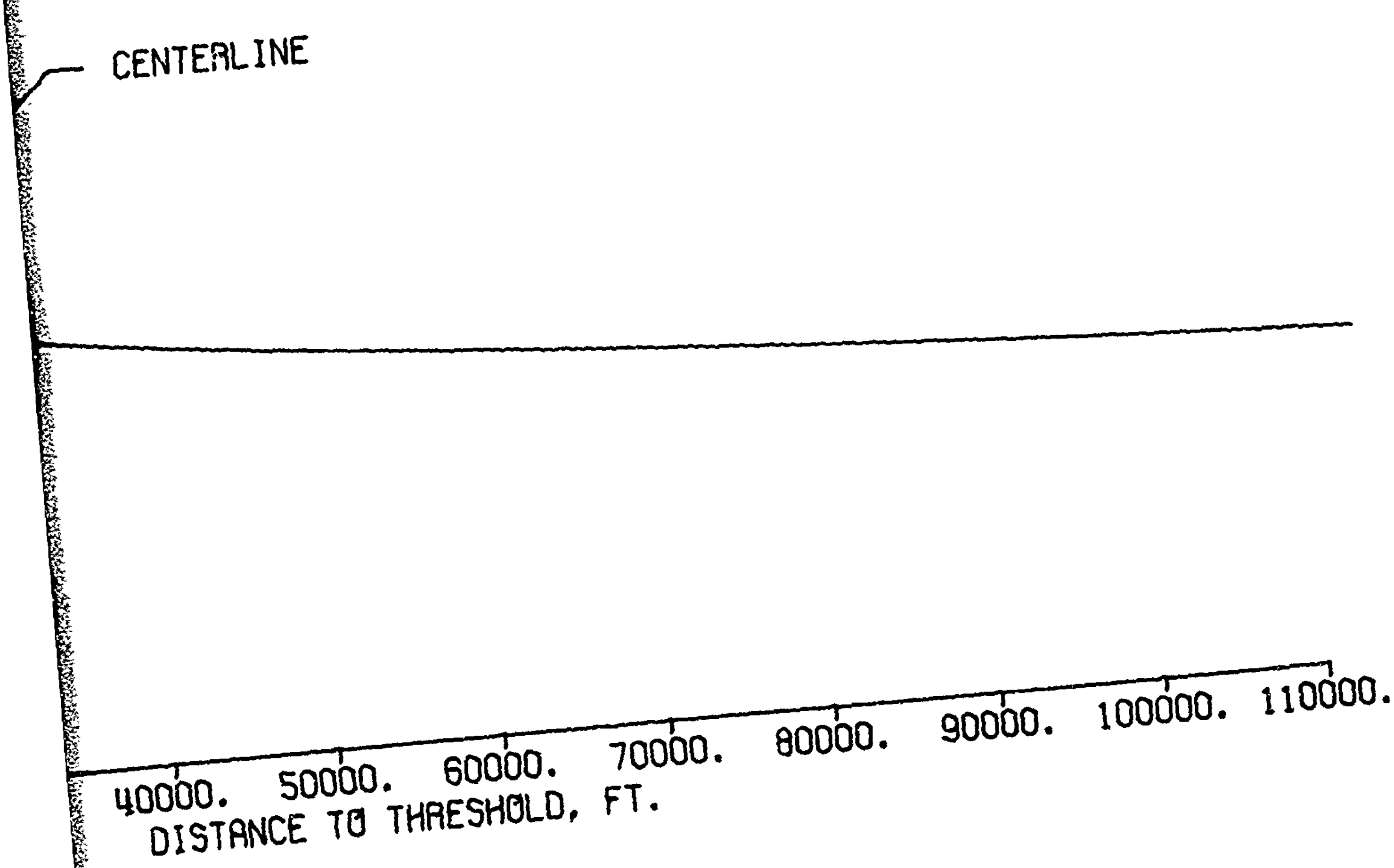
FIGURE 4.2-7g SAMPLE PROGRAM OUTPUT - TABULAR DATA FOR A ONE-SEGMENT APPROACH



NOISE LEVEL
L-1011-1 / RB211-22B EFFECTIVE PERCEIVED
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDI
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG

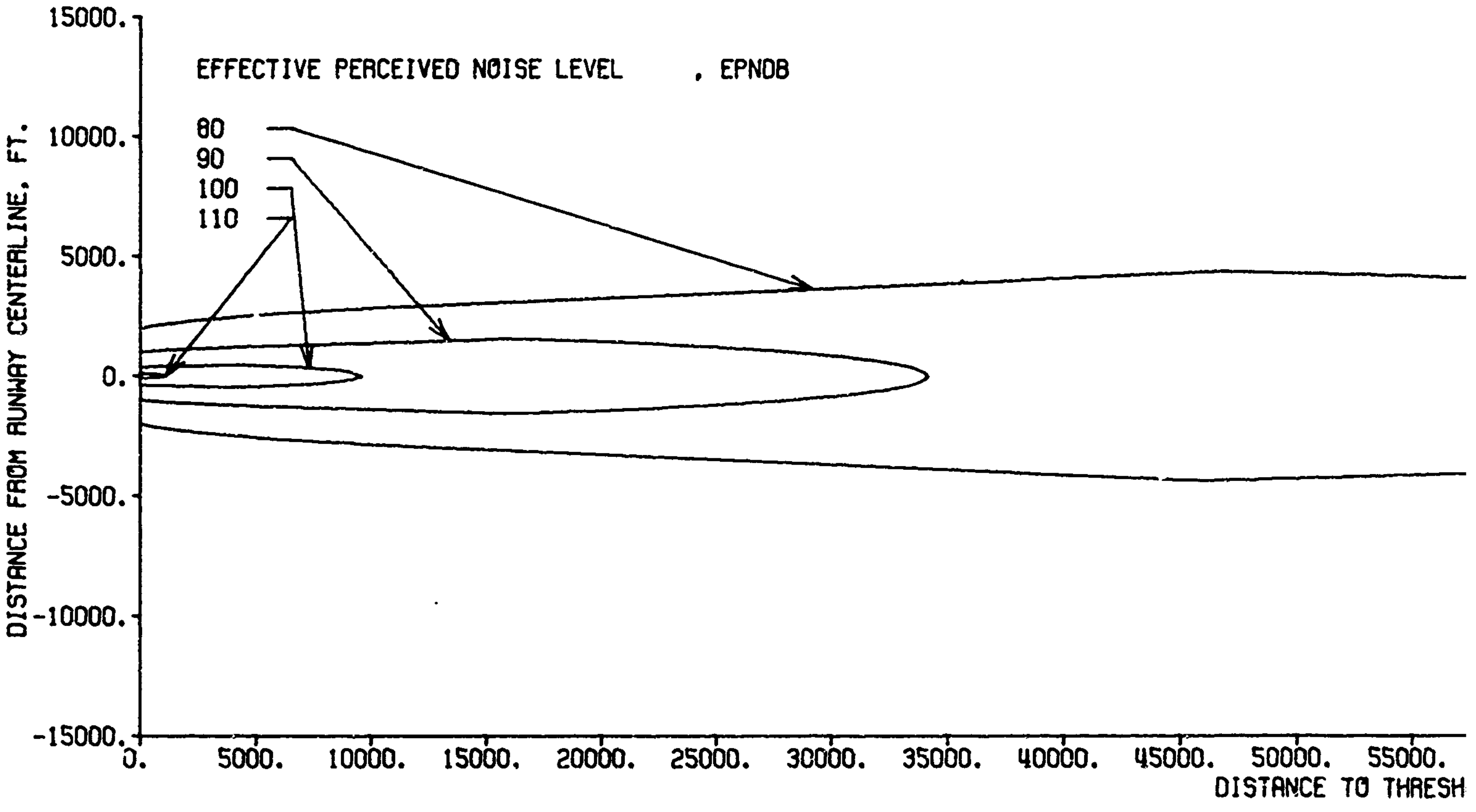
FIGURE 4.2-8a SAMPLE PROGRAM OUTPUT – PLOT DATA FOR A ONE-SEGMENT APPR

A



11-226 EFFECTIVE PERCEIVED NOISE LEVEL
DEG. F., 70% RELATIVE HUMIDITY
G WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

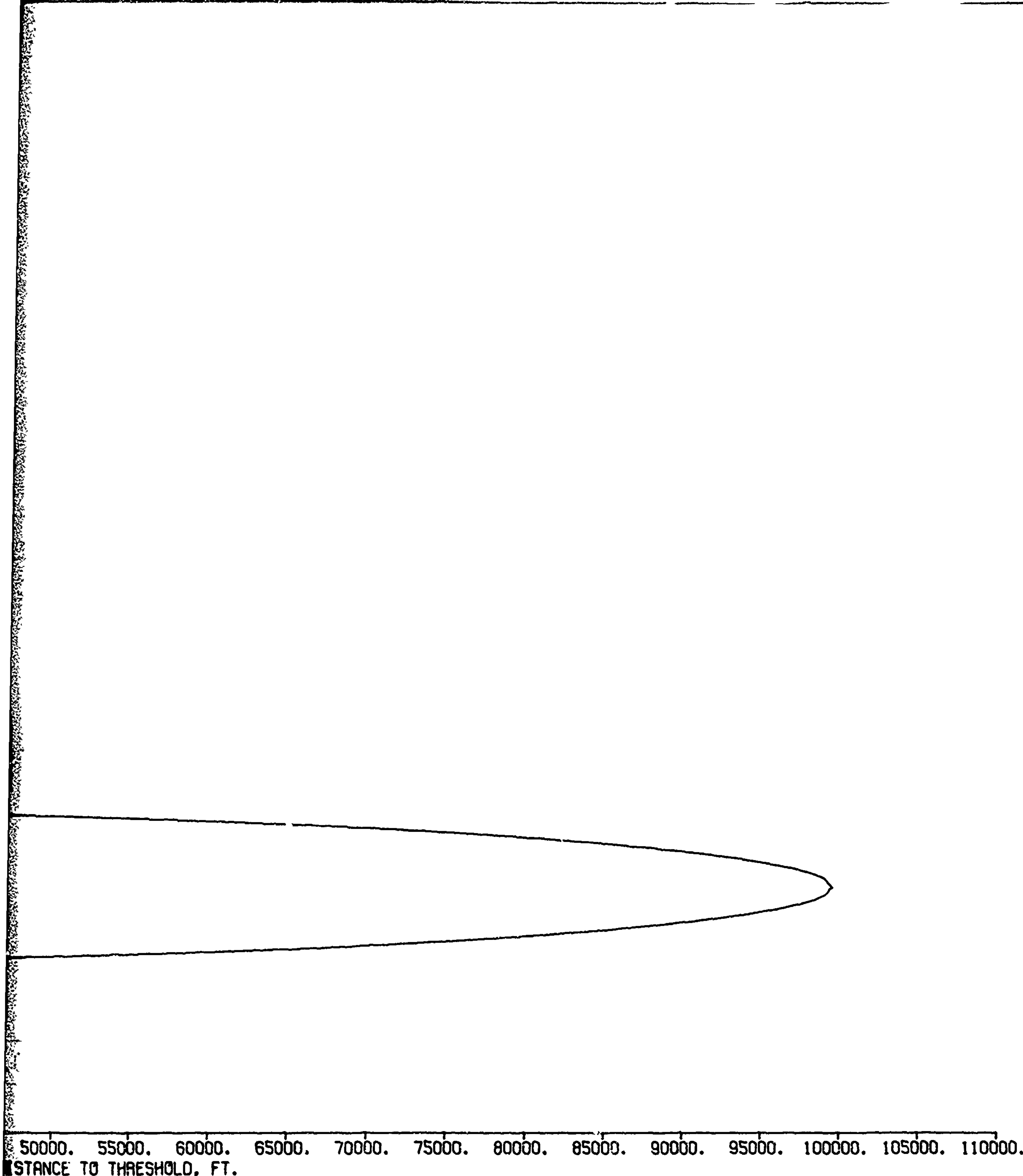
UT – PLOT DATA FOR A ONE-SEGMENT APPROACH



CONTOUR PLOTS
L-1011-1 / RB211-22B EFFECTIVE PERCEIVED NOISE LEVEL
SEA LEVEL, 77 DEG. F., 70% RELATIVE HUMIDITY
MAXIMUM LANDING WEIGHT (358,000LB.), 42DEG. FLAPS, DLC, 3DEG GLIDE SLOPE

FIGURE 4.2-8b SAMPLE PROGRAM OUTPUT – PLOT DATA FOR A ONE-SEGMENT APPROACH

A


50000. 55000. 60000. 65000. 70000. 75000. 80000. 85000. 90000. 95000. 100000. 105000. 110000.
STANCE TO THRESHOLD, FT.

E SLOPE

B

SECTION 5

SUMMARY

The Commercial Aircraft Noise Definition study reported in the various volumes of this report involved the development of a calculation procedure and an associated computer program for describing an airplane's operations and noise patterns for takeoffs and approaches. This volume has presented the logic behind the calculation procedures and has summarized the capabilities of the program and its subroutines. The program includes a noise propagation section, an airplane performance section, and a combined routine, footprint section, which generates data for plotting constant noise contours for normal airplane operations and for operational variations, such as takeoff thrust cutback and two segment approach.

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2. IEC 179, "Precision Sound Level Meters," International Electrotechnical Commission, 1965.

3. Federal Aviation Regulations "Part 36 Noise Standards: Aircraft Type Certification," Dept. of Transportation, FAA, Washington, D. C., Nov. 3, 1969.

4. LR 25089, "FAA Type Certification Report, Model L-1011-385-1 with Rolls-Royce RB.211-22 Engines," Volume 4, External (Flyover) Noise, Lockheed-California Company, Burbank, Calif., 14 July 1972.

5. Proposed Reissue of Aerospace Recommended Practice ARP 866, "Standard Values of Atmospheric Absorption as a Function of Temperature and Humidity," Proposed Draft, Society of Automotive Engineers Committee A-21 April 1970, Revised October 1972 (Private Communication).

6. Aerospace Information Report AIR 923, "Method for Calculating the Attenuation of Aircraft Ground to Ground Noise Propagation During Takeoff and Landing," Society of Automotive Engineers, New York, August 15, 1966.

7. "U. S. Standard Atmosphere, 1962," NASA, USAF, and U. S. Weather Bureau, December, 1962.

8. Part 25 Federal Aviation Regulations, "Airworthiness Standards: Transport Category Airplanes, Change 19," April 23, 1969.

9. LR 25225, "FAA Approved Airplane Flight Manual, Model L-1011-385-1," (RB.211-22C), Lockheed-California Company, Burbank, Calif., April 14, 1972.

10. LR 25089, "FAA Type Certification Report Model L-1011-385-1 with Rolls-Royce RB.211-22C Engines," Volume I Performance Tests, Lockheed-California Company, Burbank, Calif., 14 July 1972.

11. SAE Research Project Committee R2.5, "Technique for Developing Noise Exposure Forecasts," FAA DS-67-14, Federal Aviation Administration, Washington, D. C., August 1967.

12. LR 25089 "FAA Type Certification Report, Model L-1011-385-1 with Rolls-Royce RB.211-22 Engines," Volume 4 External (Flyover) Noise, Addendum 3, Lockheed-California Company, Burbank, Calif., 15 August 1973